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THE FY 1982 DEPARTMENT OF DEFENSE PROGRAM FOR

RESEARCH, DEVELOPMENT AND ACQUISITION

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I. OVERVIEW OF THE 1982 BUDGET AND PROGRAMS FOR RD&A

Mr. Chairman and Members of the Committee:

This is the fourth Research, Development and Acquisition (RD&A) program and budget request that I have presented to the Congress. The FY 82 request for Defense RD&A is approximately $69 billion. This represents a more than 4% real increase over last year's program, an increase which reflects the increased dangers to US interests in several parts of the world, as well as the continuing adverse trends in the relative balance of equipment and technology between the US and the Soviet Union. In this overview I will provide a brief summary of my annual report on our RD&A programs, highlighting the challenge which we face, the investment strategy which we are undertaking to address the challenge, and the major areas of emphasis for the 1980s.

While I am composing this overview, I am also working to effect an orderly transition of the Defense RD&A programs to the new Administration. So I find this to be an occasion for retrospection, considering the problems we faced during the past four years and the strategies and programs we have evolved to address those problems. I take pride in many of our achievements in defense technology and modernization, and believe that we are leaving a legacy on which the next Administration can build. But I also recognize that we leave some difficult problems still unsolved. I will describe both the achievements and the unsolved problems in this, my last posture statement.

A. THE CHALLENGE

Chapter II of my posture statement provides a detailed description of the net balance between the Soviet Union and the United States in military equipment and technology. Included is a comparison of US and Soviet military investment, the balance of military equipment that results from that investment and the status of our underlying military technology. To highlight the challenge I note four major points of concern:

- The Soviet Union is now outinvesting us by about a 2:1 margin. The cumulative gap in military investment between the US and the Soviet Union during the past decade now approaches $350 billion (1982 dollars).

- The Soviet Union is outproducing us by more than 2:1 in most categories of military equipment.

- The Soviet Union is now deploying equipment which increasingly matches the quality of our deployed equipment.

- The Soviet Union now has about twice as great an effort as we have in military research and development, creating a growing risk of technological surprise.

1. Investment Balance

To compare levels of defense efforts, we assess the complexity and the quantity of Soviet weapons being produced and then estimate what it would cost the United States to produce and sustain a military force having a comparable weapons inventory. Using this method, we conclude that Soviet military investment (procurement, RDT&E, and military construction), measured in constant dollars, has continued to grow at the fairly steady rate of 4% per year for the past 10 years. During most of that same period, the US military investment was declining (in real terms). The estimated dollar cost of Soviet military investment exceeded that for US defense programs for the first time in 1970, growing to nearly twice the US investment by 1980. The cumulative disparity in investment from 1971 through 1980 is approximately $350 billion (measured in terms of constant 1982 dollars). If this differential had been available for US military investment, we could have procured an additional 1,500 F-16s, 1,500 F-18s, 1,000 Advanced Attack Helicopters, 20,000 XM-1 tanks, 20 CG-47 guided missile cruisers, 50 Los Angeles Class attack submarines, 20 TRIDENT submarines with missiles, the entire M-X program and the entire ALCM program, with enough residual funds to add roughly $10 billion per year to the RDT&E program through the 1970s.

The Soviets have used this incremental investment to maintain their numerical advantage, producing military equipment at rates that are typically two or three times that of the US. As the US-Soviet investment disparity has increased, they also have been able to use it to compete with us in the quality and sophistication of their equipment, accepting the growing penalty of increasing unit costs. Their investment is also being applied to expand significantly their construction facilities. During the past few years, Soviet military production facilities have been constructed at the highest level of the last two decades, an indication of plans for sustained high production rates and improved productivity during the 1980s. Finally, the Soviets have applied their investment program to their research and development base, devoting an increasing share of their total defense expenditures to improving their military technology in an attempt to negate our technological lead.

2. Production Balance

During the past decade the Soviets have produced about three times as many ICBMs and SLBMs as the US. In the past five years they have produced about three times as many tanks and armored vehicles, twice as many tactical combat aircraft and military helicopters, four times as many attack submarines, and roughly the same number of major surface combatants. They are clearly sustaining their production advantage across a wide variety of systems.

When we consider the production contribution of our NATO allies and those of the Soviet Warsaw Pact allies, this production disparity is reduced somewhat. For example, if we compare aggregate NATO production to Warsaw Pact production during the past five years, the Warsaw Pact has produced roughly twice as many tanks and armored vehicles, about half as many major surface combatants and a roughly equal number of tactical combat aircraft, military helicopters, and attack submarines. So, to the extent that this equipment can be used effectively on an alliance basis, our NATO allies significantly reduce the impact of the disparity in production between the US and the Soviet Union.

3. Quality Balance

The Soviets historically have deployed larger quantities of equipment than the US, and we have attempted to offset this numerical advantage by producing equipment of superior quality. But the generation of Soviet equipment now being deployed is incorporating major improvements in quality. The Soviets are closing the quality gap in a large variety of military systems because of their sustained investment in R&D and the high procurement rates associated with their continuing modernization program. They are often fielding 1 1/2 to 2 generations of equipment while we field one generation, so that much of the equipment they have in the field is simply newer than deployed US equipment and therefore embodies more recent technology. For example, the average age of US

ICBMs is slightly over 10 years, while the average age of Soviet ICBMs is less than three years. The average age of US tanks that would be employed in Central Europe (less than 10,000 in number) is about eight years. The average age of the first 20,000 Soviet tanks is about four years, increasing to eight years if we include the next 20,000 tanks.

While the US remains superior in the quality of its SSBN/SLBM and bomber forces, the Soviets have effectively closed the quality gap in ICBM forces. While the US still leads in the quality of its aircraft and air-to-air missiles, the Soviet Union is closing the gap with the development of fighters (e.g., the MIG-23) having significantly improved range and payload capabilities, and with the development of a look-down/shoot-down missile for their aircraft. By the early 1980's, they will have a tactical air force capable of offensive air operations against NATO. The Soviets are proceeding with significant new developments in large (OSCAR and TYPHOON) and fast (ALPHA) submarines, but the US retains a significant advantage both in quieting and in ASW.

4. Technology Balance

Dollar cost estimates for Soviet military RDT&E (Research, Development, Test and Evaluation) expenditures have exceeded annual US expenditures during each of the past 10 years, leading to an aggregate gap of about $90 billion (in 1982 $). Their military RDT&E program is now about twice that of the US program. A clear indication of their commitment to defense technology is the trend toward increasing the share of Soviet military outlays devoted to RDT&E.

Despite the imbalance in RDT&E outlays, we have maintained our leadership in most of the basic technologies critical to defense, partly because of our focus on critical technology, but in large measure because of our commercial technology edge and the enormous momentum in defense technology derived from the lead we built up during the 1960's. But we are losing our lead in some key technologies, including electro-optical sensors, guidance and navigation, hydro-acoustic technology, optics and propulsion.

Of particular concern is the Soviet concentration on several unconventional technologies at a level far in excess of the US program. Examples include their high energy laser program and their charged particle beam program. We estimate that their high energy laser program is roughly five times the size of our own program. We believe they have made the commitment to develop specific laser weapon systems, while our high energy laser program continues in the technology base.

We are also concerned about the momentum of the Soviet research and development program. We can identify about 50 major Soviet systems at this point in various stages of test and evaluation. Many of these systems are quite significant, for example a new SLBM, a new ballistic missile submarine (the worlds largest), a new cruise missile submarine (also the worlds largest), a new interceptor and associated look-down/shoot-down missile, a new tank, and a variety of precision guided munitions. It is quite clear that the Soviet R&D program has had high priority access to funds, to trained personnel, and to scarce materials. Because of the intense and persistent Soviet commitment to defense technology, it will be much more difficult to maintain our technological advantage in the future than it has been in the past. When we consider the secrecy with which they conduct their activitites, it is clear that we will be facing in the 80's a significantly greater risk of technological surprise than ever before.

B. OUR INVESTMENT STRATEGY

We are not without strengths of our own in meeting this challenge. The US has the greatest technological capability and the strongest industrial base in the world and our allies in aggregate have a comparable capability. Our strategy for dealing with the Soviet military challenge is critically dependent on the effective defense exploitation of our broad-based technological edge (the Soviets have no analog to our commercial technology base) and effective application of the alliance industrial base. Operating in an environment in which we are being out-invested by a 2:1 margin, we cannot hope to compete on a gun-for-gun or tank-for-tank basis. To do so would require procurement budget increases not of 10%, or 20%; we would have to <u>double</u> our investment in new weapons. Then, as we finally got those weapons deployed, we would have to roughly <u>double</u> the size of our peacetime personnel to man them. Instead, our strategy is to <u>offset</u> the Soviet advantage in numbers by applying technology to equip our forces with weapons that outperform their Soviet counterparts. Fundamental to this strategy is the fact that the United States is five to ten years ahead of the Soviets in many of the basic technologies (e.g., microelectronics, computers and jet engines) most critical to our advanced weapons.

But we also recognize that such an offset strategy will not be sufficient in the long run when competing with an adversary that is out investing us by a 2:1 margin, a margin which has been continually expanding during the past decade. We also must proceed with real growth in defense investment at a rate sufficient to keep the investment gap from growing any larger. If we can sustain our real growth in investment, I believe that we can successfully apply an offset strategy which exploits three fundamental advantages: our technology, our industrial base, and our allies.

As I indicated earlier, the United States today is the world's leader in technology--both military and commercial. Maintaining our military technology lead in the future will require substantial real funding growth. Our FY 82 budget request includes real growth of about 14% in the RDT&E program.

Exploiting our lead in technology requires that we produce--at efficient rates--the new weapons that have been developed. Because of the eroding effects of unplanned inflation, we achieved no real growth in the weapons procurement account from 1978 to 1980. However, this account will grow by about 17% in FY81, and the 1982 budget sustains this new plateau. But we are still projecting inefficient production rates for most of our weapon systems because of the declining productivity of our defense industrial base. That is, our industry is experiencing a higher inflation rate than the country as a whole. This is reflected in higher unit costs, program cost increases, and ultimately in program cancellation or stretchout. Therefore, it is critically important to take actions to improve the productivity of our industrial base. These actions, described in more detail in Section D, include innovative contracting procedures to provide industry with an incentive to modernize their production facilities.

Our investment strategy also recognizes that we are substantially dependent on the military capability and political cohesion of our allies. We can improve the military capability of our allies by making the best technology available on an alliance-wide base. We are doing so by offering the latest US systems (e.g., the MODFLIR night vision equipment) for dual production in Europe. Improved armaments cooperation can also contribute to political cohesion by establishing relationships to minimize unnecessary duplication in development or production of weapons and provide a basis for coherent defense planning. We have successfully initiated such a program of real cooperation, which will lead to more and better equipment in the hands of our allies in the early 80s, and therefore to a militarily more effective alliance in the near term. Maintaining the momentum of that program will be one of the most critical tasks for the next Administration.

C. MAJOR RD&A EMPHASIS FOR 1980's

As I indicated last year, the 1980's threaten to be a period of growing international tension and danger for the US if the Soviet Union continues its military buildup and its aggressive attempts to expand political influence. Recognizing these dangers, I highlighted five objectives of our RD&A program and described specific thrusts to achieve those objectives. This year, I would like to revisit those major thrusts (adding one new one), reflect on major achievements and shortcomings, and assess the legacy which has been left for my successor.

1. Strategic Modernization

Our strategic systems are designed to deter a nuclear war. The massive buildup in Soviet forces, which began in the early 70s and is still underway, threatens the survivability of our strategic forces, and therefore weakens their ability to deter. The first priority of our strategic modernization program is to restore high confidence in the survivability of strategic forces.

The survivability of our bomber forces is threatened by the increasing capability of Soviet air defense systems, specifically by their introduction of look-down/shoot-down missiles. In 1977 we were faced with a choice between modernizing our bomber force by replacing the B-52 with the B-1 bomber or by augmenting the B-52 with cruise missiles. Establishing survivability as our principal criterion led us to choose the cruise missile because it will be able to penetrate the new Soviet air defense systems far more effectively--a result of its small radar signature, low altitude and large numbers. We completed the development program and began serial production this past year. The first cruise missile will be deployed on an alert B-52 this September, just four years after the beginning of full-scale development. This program has been a major achievement, but it will require continued high priority and management attention to achieve its challenging deployment schedule.

The survivability of our Minuteman ICBM was threatened by the combination of a three-fold increase in quantity and two-fold improvement in accuracy of Soviet ICBM warheads. Therefore, we proposed to modernize our ICBM force by developing a mobile missile, the M-X, which would have 200 missiles deployed covertly among 4600 shelters, making targeting by Soviet ICBMs impractical.

We are now well into full scale development of M-X, and the first missile test flight is scheduled for 1983. However, the M-X system will not achieve IOC until 1986, whereas the Soviet ability to attack Minuteman will occur in the early eighties. During that "window of ICBM vulnerability" we will place a greater reliance on the bomber and submarine forces to maintain our deterrence; indeed, the primary reason for having a TRIAD of strategic systems is because each of them becomes vulnerable in different ways and at different times, thus complementing each other.

We have made major technical and programmatic achievements in carrying the M-X program this far, but I believe the program is still very much "at risk." The new Administration will have to make an early decision about whether they agree with our judgment on the M-X. If they do, it will take all of their energy and persistence to carry this program through to deployment. If they prefer a different basing approach they have a long struggle ahead to define the new program, get Congressional approval, and then initiate a new environmental approval and land acquisition process, which is the pacing item in the operational date of any new ICBM basing system.

Our submarine systems are not faced with a near term problem in survivability. But as a hedge against the development of a future anti-submarine threat, the previous Administration initiated the development of a quieter submarine (TRIDENT) and the development of a longer range missile (TRIDENT I). The longer missile range allows the submarine to stand back several thousand miles from the borders of the Soviet Union and still cover all of its targets, thereby increasing the available ocean patrol area of the submarine many-fold. This is a fundamental step toward maintaining the survivability of our submarines.

We inherited a smoothly running development program for the TRIDENT I missile and have carried it smoothly into production. We are converting twelve POSEIDON submarines to carry the TRIDENT I missile; the first five of these submarines are already outfitted with the new TRIDENT missiles and are operationally deployed. The submarine is another matter. We inherited serious contractual and production problems on the TRIDENT submarine program. The contractual problems have been resolved, but we still have production problems, and we do not yet have a TRIDENT submarine in the operational force. Deployment of the TRIDENT submarines no later than their current schedule (already slipped more than two years) is a matter of great national significance in view of the period of ICBM vulnerability and the ongoing retirement of POLARIS submarines. Any further slippage will require additional management actions as well as re-evaluation of the decision to retire POLARIS submarines.

In summary, there are four major programs underway leading to the modernization of our strategic forces. All of them emphasize improving survivability, thereby strengthening the deterrent credibility of our strategic forces. But it is also true that these programs incorporate a significant degree of performance improvement as well. The ALCM, TRIDENT I missile, and M-X all incorporate significantly improved performance relative to present systems--some include a modest increase in warhead yield, and all provide a significant improvement in accuracy. I believe that these ongoing programs will be sufficient to maintain high confidence in our ability to deter nuclear war, given that they are continued by the next Administration and given some measure of strategic arms control between the US and the Soviet Union.

We have not yet made major decisions on two potential new programs--a new bomber to replace the B-52 and a new submarine missile as a follow-on to the TRIDENT I missile. In my judgment, the issue is not whether to proceed but when. Proceeding with the full-scale development of both programs now would lead to IOCs in 1987 - 1988, with major expenditures occurring in 1983-1986, the period of peak expenditures for M-X. If we add these expenditures to those for M-X, the huge bulge that results will impact both the funds and industrial resources available for our tactical weapons modernization. Therefore, I believe that both of these programs should be phased three to four years later than M-X, which would lead to IOCs by the early 90s. This would bring TRIDENT II on line in time to outfit the second squadron of TRIDENT submarines as they are being commissioned, and in time to backfit the first squadron of TRIDENT submarines as they are overhauled. It would bring a new bomber on line initially (early 90s) to replace the B-52 as a penetrator, and later (mid-to-late 90s) to replace it as a cruise missile carrier. This is the best advice I can leave for my successor who must deal with the conflicting demands between these new strategic programs and our even more urgent tactical programs.

2. Improved Capability For Rapid Deployment Forces

I typically devote a substantial portion of my posture statement to a discussion of strategic programs because of the extent of public interest and debate on these programs. Yet I believe that the strategic modernization programs already under way deal adequately with the major survivability problems facing our strategic forces. On the other hand, a war is already underway in the Persian Gulf, and we urgently need to become better prepared than we now are for the possibility of military action in that part of the world. Substantial actions already have been taken: we have deployed two carrier task forces to that area; we have prepositioned seven large cargo ships at Diego Garcia, loading them with the heavy equipment and supplies for a Marine Amphibious Brigade and its associated air; and we have negotiated access to areas which could be used as staging facilities for our land-based air.

But major new programs are required to equip our forces adequately for military contingencies in the Persian Gulf. We need substantially more airlift--the equivalent of more than 100 additional C-5s--capable of quickly moving outsize equipment to that area. As a consequence we have initiated the C-X program, but that program is at risk because of its projected cost and the controversy surrounding the choice of airplane. This is particularly ironic since the controversy is largely misplaced: the key issue is not the design specifics of the C-X, but rather the urgent need to get substantially more airlift that can carry outsize Army equipment across an ocean.

We also have made an embryonic beginning on programs which will provide equipment specifically designed for light armored forces. These forces should be transportable by C-141s and C-130s, yet be able to stand up to opposing armored divisions. We don't have anything like that now. We either have forces (albeit limited) which can be easily carried, but which could be overrun if they faced an armored division, and we have heavy armored forces that cannot be carried by any aircraft except a C-5. There are existing off-the-shelf alternatives for light-armored vehicles, and both the Army and Marine Corps have proposed programs to develop light-armor fighting vehicles. There are many similarities in their proposed programs, but a common development program will not be possible unless we can resolve present differences in operational requirements. We have underway a set of field experiments using a variety of vehicles. Results of these tests will be available late this year. Development of both near and long term programs for light armor vehicles is an important item of unfinished business for the new Administration.

3. Improve Anti-Armor Capability

One of the most important objectives of our modernization program is to enhance the ability of our tactical forces to stop an armored blitz on Western Europe. The Soviets have a substantial advantage in their ground forces, both in number of troops and quantity of armored assault vehicles. We need to develop greatly improved anti-armor weapons for our ground forces, and to strengthen our Allies' capabilities along with our own.

We are developing, as fast as we can, a third generation of anti-armor precision guided munitions in the form of artillery projectiles, bombs, ground-launched missiles and air-launched missiles. This third generation will include direct hit systems so they can be lightweight and still highly effective; they will be fire-and-forget so the operator can fire them and take cover; and they will be capable of operating under virtually all weather conditions. These new weapons will have a revolutionary impact on our forces when they are built and deployed. But that won't be until about the mid-80s, even with an expedited development program and a little luck.

Therefore, we have to continue to push hard on the production of new second generation laser-guided systems, such as COPPERHEAD and HELLFIRE, even as we recognize their limitations. And we have to fix the anti-armor weapons already deployed, particularly the TOW anti-tank guided missile. We have a TOW improvement program which will allow the TOW to be fired at night and in adverse weather, and give it the capability to penetrate the increasing toughness of Soviet tank armor. We are expediting this program to get these changes incorporated in field equipment in a year or two instead of simply waiting for the next generation of systems to provide needed improvements. Both the near and the medium term anti-armor programs are well underway but will need vigorous support by the next Administration to achieve the desired schedules and production quantities.

4. <u>Maintain Air Superiority</u>

The Soviets today have superior ground forces in Europe and that situation is not likely to change in the foreseeable future. Even with this advantage, it is hard to believe that they would initiate an armored assault if they could not control airspace over Europe. Therefore it is crucial that we maintain our superiority in the air. I believe we have air superiority today, but it is eroding. We have it today because our airplanes and pilots are superior to those of the Soviets. The F-4, F-15, and F-16 are all superior to the MIG-19 and MIG-21. But the Soviets are introducing new airplanes--the MIG-23 and MIG-27, and the modified MIG-25--while developing a new generation of tactical aircraft. These airplanes are not modeled on the simple, straightforward designs of the MIG-19 and MIG-21. They are sophisticated, very capable airplanes. By the mid-80s, while we still expect to have some advantage in airplane performance, it will be a narrow edge and may not be sufficient to compensate for the advantage in quantity that they will have by then. They are producing tactical aircraft at about twice the rate that we have for the past ten years. So we are facing a substantial problem.

Our solution to that problem is to get substantially improved fire power and substantially improved tactical information systems in our airplanes. We are building a new missile called AMRAAM which will have a high altitude standoff range of 30 to 40 miles; it will be able to engage more than one target at a time; and it will have a fire-and-soon-forget capability. This combination will provide a substantial tactical advantage relative to our present missiles or relative to any missiles which the Soviets are likely to have in that timeframe.

Our advanced surveillance technology is critical to maintaining our air superiority, and to our ability to apply our aircraft-based counter-armor systems while preventing the Soviets from employing theirs. Our AWACS airborne warning and control system, now deployed, has the capability to provide warning while Soviet aircraft are hundreds of miles deep in their own territory. Having gathered this warning and surveillance information, we need to disseminate that information to our fighting forces so we can properly distribute them and plan our response. A system that will have a revolutionary impact in this regard is the Joint Tactical Information Distribution System (JTIDS). JTIDS provides the capability to disseminate information collected by our surveillance systems, and provide it directly to our fighting forces. The result is the capability to provide each fighting unit with the analog of the situation display used by our major commanders in World War II. Our units will have the capability to identify and locate enemy forces, identify the location and composition of friendly units and plan engagements accordingly. Given this information, they can choose the time and place of their attack to minimize their own exposure and maximize the enemy's. So while we do not have global superiority in terms of the total size of forces, we will be able to achieve local superiority by knowing the precise location and composition of enemy forces.

Finally, our development of low-observable ("stealth") technology will play a critical role in maintaining our air superiority. These aircraft will provide a very effective weapon against Soviet air defense systems, which are both very capable and very densely deployed. We have long recognized the enormous leverage which this technology can provide by countering the massive investment the Soviets have made in defensive systems during this past decade.

5. Maintain Naval Superiority

To understand the naval warfare modernization problem it is essential to discard the notion that naval force is simply a matter of ships: the number and quality of our ships are important factors in naval warfare, but the day is long past when ships (or even ships plus submarines plus aircraft) are the primary determinant of naval forces. Today it is a complex interaction between these vehicles and a wide variety of other systems which determines naval strength.

In cases where we can bring our sea-based tactical air forces to bear, we enjoy a margin of naval superiority over the Soviets, despite their greater numerical force levels. But, recognizing superior Soviet force levels, the fact that we make broader demands on our naval forces (in particular for projection of air and amphibious power ashore), and the fact that we are far more dependent--militarily and economically--upon the sea, we cannot expect to defeat Soviet naval forces by overpowering them in all scenarios. Therefore we have to depend also on applying our superior technology to advantage. This will be especially critical in maintaining our anti-submarine warfare (ASW) capability and improving our anti-air warfare capability.

a. Maintaining ASW Capability

With the exception of a few years during World War II, the Soviets have had the world's largest submarine fleet for nearly half a century. The Soviet leadership evidently regards submarines as the primary striking arm of the Navy. Since Soviet submarines would oppose any attempt to bring our naval striking power to bear against Soviet territory or against their land forces, the destruction or neutralization of submarines operating in these roles is clearly an important naval mission. The most significant problem which our antisubmarine forces must address is that of finding enemy submarines. We have had remarkable success in the development of passive acoustic systems able to detect submarines at very long ranges. We are now entering production with towed acoustic arrays, such as SURTASS, to augment our SOSUS system. And we have under development acoustic arrays and advanced processing which will give us a tremendous advantage in the ASW problem. We believe that we are five to ten years ahead of the Soviets in this vital capability. Intelligent and well coordinated use of long range acoustic arrays, in conjunction with information from all other sources, makes it possible to effectively contain a large submarine threat without great numerical superiority.

The advent of long-range detection systems has increased the importance of aircraft--particularly of wide-ranging land-based aircraft--because of their unique ability to reach contact areas swiftly. Submarines have also taken on increased ASW importance (particularly since we have developed towed acoustic arrays for them), because of the nuclear submarine's ability to operate with considerable freedom in areas denied to other forces. Surface ships have lost importance in a relative sense, but continue to be needed as escorts, since some submarines will escape the long-range detection net. The T-AGOS program, which consists of small surface ships towing long acoustic arrays at low speeds, will be used to fill gaps in our fixed long-range detection arrays.

b. Improving Anti-Air Warfare Capability

In World War II we found that well-trained and adequately-equipped air forces could always overwhelm and destroy surface ship forces, unless the ships were protected by superior air power. The Soviets seized upon this lesson and exploited it with vigor and originality They built a powerful force of land-based strike aircraft and equipped them with cruise missiles, permitting them to make accurate attacks without undue exposure to defending weapons. Prior to the mid-1970's the threat posed by Soviet Naval Air, though certainly very intense, was restricted to seas relatively close to Soviet bases. But introduction of BACKFIRE medium-range bombers has now expanded its reach to cover significant portions of the North Atlantic and North Pacific Oceans. BACKFIRE production is continuing and the Soviets are working on more advanced aircraft.

In response to the threat of anti-ship cruise missiles launched from submarines, surface ships, aircraft, or land sites, we have developed a variety of defensive systems for individual ships and entire forces. The newest of these systems (e.g., AEGIS, SM-2) appear very promising, and are included with high priority in our proposed program. However, even the AEGIS system is vulnerable to saturation under heavy (but feasible) levels of attack, and it is too costly for widespread application. Therefore it is essential to supplement our defensive measures with suitable active offensive measures against Soviet Naval Air; key among those measures is the capability to attack airbases with our cruise missiles. This will be one of the capabilities of the land-attack SLCM and the MRASM programs now in full scale development.

6. <u>Maintain the Health of Our Technology Base</u>.

Long term exploitation of our technological advantage is fundamentally dependent on maintaining the health of the defense technology base. At the beginning of this Administration I recognized that the technology base program that we were working with was in real terms about half the size of the defense technology base program in the mid-1960s. The result of inflation from the mid-1960s to 1977, in conjunction with a fixed level of technology base funding in then year dollars, has cut the purchasing power of the program in half. To put it another way, we had in 1977 about half of the researchers working on defense technology that we had in 1964.

Therefore, we established the objective of increasing our technology base funding at about 7% per year in real terms until we restored the purchasing power which we had maintained in the mid-1960s. Our intent was to increase research at a 10% annual rate and advanced technology at a 5% annual rate. Largely because of reductions by the Congress--especially those made early in the term of this Administration--we have not achieved our full expectations for real growth. It has taken longer than I had expected to initiate a program containing real growth, and we have not achieved the levels of growth I had hoped for. But we have stopped the decline in defense technology funding and have begun the task of rebuilding this vital program. This gives the new Administration a reasonably strong base to build on, and I believe there is today a receptive attitude in the Congress toward maintaining real growth in our technology base.

I have concentrated the real growth which we have been able to achieve on four or five major initiatives, ensuring that they receive substantial funding growth.

Perhaps the most significant initiative is the VHSIC (Very High Speed Integrated Circuits) program. The VHSIC program is intended to accelerate by a few years the introduction of the next generation of micro-electronics into defense systems, thereby maintaining our five to ten year lead over the Soviets in this field. This is particularly critical, since micro-electronics is the key to the superior performance of our next generation of precision-guided munitions, air-to-air missiles, and submarine detection systems. Micro-electronics is also the key to reducing the cost and maintenance requirements of our military systems. The VHSIC program is now well underway. We have already issued contracts to address system architecture, to define integrated circuit testing and processing equipment, and to provide the supporting technology. Follow-on awards this spring will develop integrated circuits with over 100:1 improvement in speed, as well as significant size and reliability improvements relative to the present state-of-the-art.

Another key initiative is our materials technology program. Our program of metal matrix composite materials is proceeding on schedule toward application for a variety of uses, including laser mirrors, lightweight gun mounts, submarine propellers, and radar antennas. Trade-off studies indicate that these materials can result in substantial weight reductions, as well as substitute for critical materials such as chromium, cobalt, titanium and beryllium. We believe that the use of metal matrix composite materials will someday rival that of fiber-reinforced plastic composite materials. Our materials technology program also includes the vigorous pursuit of rapid solidification technology (RST). This new technology makes possible very high quality families of aluminum and titanium alloys and previously unattainable high temperature super alloys for gas turbine engines. RST technology can lead to dramatic improvements in a variety of applications. Our near term emphasis is on application to engine hot-section components. For example, nickel, when alloyed with aluminum, molybdenum and tungsten will yield a 200°F improvement in heat resistance relative to current jet engine super alloys. This makes possible an engine of higher performance and greater fuel efficiency, or alternatively, an engine with performance and fuel efficiency comparable to present engines, but with much better reliability and maintainability characteristics. Other RST related alloys show the potential for a 30% reduction in future airframe weight and the possibility of developing chromium free stainless steels for use in critical jet engine components.

D. RD&A MANAGEMENT EMPHASIS FOR THE 1980s

Our RD&A program represents one of the largest "businesses" in the world, totalling nearly $69 billion for 1982 ($19.8 billion in RDT&E and $48.9 billion in production of weapon systems). In the preceding section I described the emphasis we are placing on particular programs to exploit our technology to <u>maximize military effectiveness</u>. In this section I will describe the emphasis we are placing on management initiatives to achieve <u>maximum efficiency</u> in the procurement of our systems. These initiatives apply to a broad spectrum of our programs and are designed to reduce acquisition costs, reduce delays in fielding equipment, and make maximum use of the military support or our allies. These initiatives have evolved these past few years into four major categories:

- Improve Cooperation with Our Allies
- Improve the Productivity of our Industrial Base
- Improve the Effectiveness of Our Program Management
- Deal with the Problems of Inflation

1. Improve Cooperation With Allies

We are making improvements in our forces by designing and building new weapons, and by changing our force structure and tactics. But in the last analysis, we are dependent to a very great extent on our allies, on their ability to fight effectively as an alliance, and on their political cohesion. With that in mind, we have considered the systems that we are developing and compared those with the systems being developed and introduced by our allies. In many cases the US systems are significantly more effective. That is not because Americans are smarter than Europeans, but because we spend almost $20 billion per year on defense R&D, while no one of our allies spends as much as $2 billion. So there is a roughly 10:1 ratio in defense R&D spending between ourselves and any of our NATO allies taken alone. Therefore their ability to advance defense technology and to develop and test specific weapon systems is far less than ours, and it is not surprising that we have developed a broader spectrum of advanced systems. If our European allies limit their weapon production to their own designs, they will be depriving themselves of the very substantial benefits of our defense R&D program and will often not produce the most effective weapons for their forces. As a result, the ability of the alliance to fight alliance warfare will be substantially reduced.

Recognizing the significant military benefits to be derived, we set out with a major objective to introduce real cooperation in the development and production of weapon systems. A prime objective was to get the fruit of the US defense R&D program available to our allies as well as to ourselves. A simple way to do this would be to have our allies buy our F-16s, A-10s, AMRAAMs, etc. But our allies have their own defense industry and their own political constraints on defense dollars flowing across the Atlantic. The problem was to achieve our military objective subject to the constraint that a substantial amount of European defense equipment had to be built in Europe.

One very effective solution to that problem is to take programs going into production in the United States and offer them for production in Europe (dual production). For example, the AIM-9L missile--at that time the latest air-to-air heat-seeking missile which was in production in the US--was offered for production by a German-led consortium. We offered this as an alternative to the Europeans developing and building their own heat-seeking air-to-air missile, a missile which I believe would have been inferior to the AIM-9L. We agreed to make all the technical data available to the Germans, including production assistance to get it started. We asked for no royalty charges.

That program met substantial resistance, not only among the defense contractors in the US, but among the defense contractors in Europe as well, with added resistance from the Congress and Parliaments of all countries involved. European opposition was based on the desire to develop and produce their own weapons, not taking into account the fact that they do not have the defense R&D program needed to adequately support that decision. In the United States, the opposition was based on the view that we should produce missile systems and sell them to the Europeans rather than allow them to build our designs. This view suffers from the fatal flaw that the Europeans would not accept it.

It took a few years to persuade both sides of the mutual benefits and then to initiate the major programs which are currently underway. These programs include the AIM-9L air-to-air missile, MOD FLIR night vision devices, and the M483A1 improved conventional munition. The COPPERHEAD laser-guided projectile and STINGER man-portable air defense missile are now in negotiation. These are not token programs. They all involve first line, modern systems which are just now going into production in the US, and they soon will be starting production in Europe. The net result will be more and better equipment in the hands of our allies--equipment which will be deployed with allied forces only a year or two after deployment with US forces.

We also have significant cooperation underway in the development of major weapon systems, including our new multiple launch rocket system, our next generation of air-to-air missiles, and our next generation of anti-tank guided missiles. Finally, we have in the last four years signed agreements with each industrial country in NATO to remove "buy-national" restrictions on a reciprocal basis so that NATO defense markets will be open to international competition.

This entire program of NATO armaments cooperation is a major achievement which required very substantial management attention and--perhaps more than anything else we are doing--will require special nurturing by the next Administration. It has taken more than one year to develop, another two years to gain understanding and support from our allies and we are now about one year into the program. Maintaining the momentum of this program is one of the most critical tasks in the year ahead.

While there is a great deal of focus on our armaments cooperation initiatives within NATO, we have also had significant accomplishments in armaments cooperation with non-NATO countries. Our cooperative programs in the Far East and the Middle East have expanded in the past four years, with the objective of obtaining equipment commonality with Japan, Australia and New Zealand just as we are trying to do with our allies in the North Atlantic Alliance. We hope to broaden our cooperation with Japan, sharing more of the benefits of our respective technical and industrial strengths.

We have recently had our first exchanges with the People's Republic of China, including a technical delegation to China which I led. China has identified defense modernization as one of her four major objectives for the next decade, and perceives that western technology is a key to achieving that objective. China is not an ally, but does tie up almost fifty Soviet divisions on the China-Siberia border. Our present policy limits technology exchange with China to civil systems and dual-use systems (e.g., radars). A mutually beneficial defense cooperation can be built on this policy; alternatively, the new Administration may want to explore ways of prudently broadening our cooperation in technology.

We are also proceeding with a number of cooperative efforts called defense production assistance programs. These programs--currently underway with Egypt, Indonesia, the Republic of Korea, and Turkey--are designed to assist by recommending/developing methods for improving defense production capabilities in those countries. They are implemented through foreign military sales procedures or commercial license arrangements. The production assistance effort considers overall country needs and capabilities and applies US assistance to obtain an expanded production base. Given the success of this program during the past year, we expect expanded application in the year to come.

2. Improve the Productivity of our Defense Industrial Base

The current condition of the US industrial base can be characterized as unbalanced. While sufficient capacity generally exists at the prime contractor level to support Defense programs, deficiencies exist at the subcontractor and vendor levels. The steady growth of the commercial market when compared with the cyclical nature of Defense business, and more recently the post-Vietnam era of decreasing Defense procurement, has made Defense business unattractive to many suppliers. Over the past several months, as a result of a boom in commercial aircraft production, parts of the aerospace sector have become saturated with orders. Bottlenecks have occurred in many sectors, such as specialized electronics, forgings, and specialty metals.

In addition to the growing demands of the commercial aerospace sector, the supply situation for many raw materials and semi-finished commodities warrants close attention. The United States' dependence on foreign sources is growing. While the US is from 50 to 100% import dependent for 20 key industrial commodities, the Soviet Union is foreign source dependent for only six of these materials—none exceeding 50%.

US investment in productivity-improving technology simply has not kept pace. In the past two decades, our productivity gains have lagged significantly behind those of other industrialized countries, bringing us to a point where much of our industry is less efficient than Japanese, German, French or Italian industry. Last year Japan produced more automobiles and more trucks than we did.

The US is still competitive in the aerospace sector, but our world market share decreased from 66% to 58% percent during the decade of the 1970's. This sector is one of the main contributors to our technological edge in defense systems and is at the very core of our defense industrial base. The continuing loss of market share has major security implications because the loss of markets also means the loss of capacity, capability, and skills that could be used during a national emergency.

The DoD needs to take a stronger role in encouraging increased investment in productivity enhancing equipment by private industry. One way is to provide more stability to the defense related market place. Multi-year contracting is one way to improve stability. For the most part, we contract today on a year-to-year basis. We are convinced that year-to-year contracting is not conducive to the improvements we need, and are therefore initiating a multi-year contracting approach, beginning with a sample set of stable programs identified by the Military Departments for FY 1982 initiation. We expect to build upon this base of multi-year contracting awards in the future.

We have also examined our current progress payment policy in an attempt to free operating capital for investment in productivity enhancement, and have designed a progress payment procedure with flexible progress payment rates that will be tailored to individual contracts.

The DoD Manufacturing Technology Program is another means to increase the productivity and responsiveness of the Defense industrial base. Numerically controlled machine tools were developed through this program, and the use of these machine tools in the production of DoD systems--as well as in the private sector--has saved billions of dollars in metal removal costs and significantly reduced production leadtimes.

The Manufacturing Technology (MT) Program can also reduce foreign dependence on critical materials. For example, one of the MT projects perfected "near neat shape forging" for jet engine disks. This process resulted in a 50% reduction in critical materials usage through reduced machining and material waste. During the past four years we have given increased emphasis to this program and have laid the ground work to more than double the MT budget in the next few years.

Another step we have taken toward solving these problems is action under Title III of the Defense Production Act (DPA). Title III provides a mechanism for establishing or expanding domestic production capabilities. In the Korean War Period, Title III of the DPA was used to establish $8.4 billion worth of industrial capability with government investment of less than $0.9 billion.

There are other material and manufacturing industries vital to the national security which can be stimulated through Title III actions. The machine tool industry would be a prime candidate, but before additional actions are started it is necessary to prove that Title III can again be an effective tool for increasing domestic material capabilities.

In summary, the Defense Industrial base needs revitalization. But the available steps will not produce near term results and no single action can remedy all the ills. I have suggested actions which involve a combination of acquisition process adjustments, technology advancements, and capital investment initiatives. Working to restore the current imbalances and improve productivity are significant tasks for the next Administration.

3. Improve the Effectiveness of Our Program Management

A number of programs that entered development in the late 1960s or early 1970s have taken 10 to 15 years to reach operational capability. Such extended development periods result in deployed systems embodying obsolete technology, thus limiting the extent to which the US technological advantage can be operationally exploited. During the latter half of the 1970s, with the encouragement of the Congress, we began the development of systems using accelerated procedures.

Great care must be taken in the selection of the programs for accelerated acquisition. The technical risk must be low and special management auditing must be used to get early warnings of trouble. But the benefits that can be achieved from an accelerated process are great. We have successfully applied these techniques to the cruise missile program, the Division Air Defense Gun program and the Multiple Launch Rocket System program, all of which are successful, and all of which are taking less than five years to go from the beginning of full scale development to IOC. We plan to continue using accelerated acquisition procedures for those programs in which the benefits outweight the costs.

Let me reflect on one of the critical acquisition management issues by reviewing a number of programs which were in the final stages of development in 1977, and have begun to transition or already have transitioned into production. Examples include the PATRIOT missile, the XM-1 tank, ROLAND, the SURTASS towed array, and CAPTOR. Each of these programs has had some substantial problem associated with it. My experience as the Acquisition Executive indicates that those problems generally remain well hidden until we begin transitioning the program from development to production. At this transition, suddenly all of the problems--cost, schedule, technical problems--come to the surface. The critical management question is, what do we do about it at this stage?

There is a great dichotomy of views in response to this question. There is a substantial set of views--both in the Pentagon and in the Congress--which reflects an "off with their heads" (i.e., cancel the program) attitude. On some programs that was the appropriate action, and the action which we took. The opposite action is to move into production anyway, expecting to fix the deficiencies after the system is deployed in the field. I have generally avoided this approach. The course which we have followed--not as a compromise--but as a way of intelligently addressing the problems that we often face in these programs, involves managing the development phase and production phase of the program concurrently. On major systems like the XM-1 tank or SURTASS--where we have an urgent need and we know that we are eventually going to build the system--the question is not <u>whether</u> the system should enter production but, given the test data and the cost data, what is the most effective way of entering production? Our approach has been to phase into a limited rate production program while we continue the necessary adjustments in the development program and continue the testing to prove out the changes being made. That limited production rate has been held until the test data proves the system has achieved its necessary performance and reliability parameters. Then--and only then--do we authorize full rate production.

The XM-1 tank provides an illustrative example. Although we experienced significant test problems on the XM-1 tank program, the Army's view was that we should proceed into full-scale production immediately and fix the problems later. Others argued that we should stop the program until suitable fixes were demonstrated. Having examined the manufacturing plant and the manufacturing team being put together for this program, it became apparent that neither alternative was attractive. What was clearly needed in this situation was to get the manufacturing process started, then ease gracefully into production. A significant side benefit of this approach is that it allows operational testing to be performed on systems that have been produced in a manufacturing environment that closely approximates the final production environment.

4. Deal With The Problems of Inflation

When we began our planning for the Fy 78 - 81 budgets we recognized that we were facing a bow wave of requirements for modernization in all the Services: in the Army because of the modernization pause during the Vietnam War; in the Navy because of the decline in shipbuilding during the 70s; and in the Air Force because of the need for a major modernization of strategic forces. To meet these requirements we planned for substantial annual real growth in the DoD procurement budget, a growth which would allow us to procure many of our major weapon systems at economic annual rates. We have retrospectively examined the history of growth in the procurement account from the base year of FY 77 to FY 81. In the FY 78 Five Year Development Program we were planning for cumulative growth in the procurement account of some 40%. When we look at the budgets actually submitted year by year, the projected real growth was reduced somewhat to 27%. But that projected real growth was substantially eroded by inflation which was higher than forecast at the time of each annual budget submission. Using after-the-fact estimates for inflation derived from the Office of Management and Budget (OMB), we estimate cumulative real growth in procurement since FY 1977 to be about 14%. But these OMB-supplied inflation rates are based on a broad price index which we believe understates the real inflation experienced in the defense industry. To investigate further, we commissioned a study by the public accounting firm of Coopers and Lybrand. Coopers and Lybrand investigated inflation in 1979 and 1980 based on a sample of the inflation experienced on aerospace contracts during those years. The Coopers and Lybrand Study results track closely with the consumer price index change during that period. Using results based upon their inflation estimate, we estimate that the real growth in procurement from 1977 - 1981 is less than 6%.

The consequence of this continuing inflation estimation problem is that our budget planning gets farther and farther off track each year. The overall impact on our modernization program has been significant. While the bow wave associated with Army modernization, ship building and the modernization of our strategic forces implies the need for the real growth we had planned for, in practice we find that we have experienced decreased purchasing power every year from FY 78 through FY 80. As a consequence, we have had to both cancel and stretch our programs. Stretching programs further aggravates the problem by leading to inefficient production runs and longer time periods for inflation to act. We have made adjustments in an attempt to account for this problem in both the FY 81 and FY 82 budgets. But we don't know if the increases are sufficient until we calculate (after the fact) what the real inflation rates were.

It seems clear to me that the procurement account should be corrected on an annual basis for errors in the inflation factor used in the budget submittal. This correction could take the form of a supplemental budget (as we do for corrections in salary estimates) or by modifying appropriately the budget for the following year. Whichever correction is used, the incremental funds should then flow down to the program manager so that he can do a responsible job of managing his program. Then we can hold him accountable for those elements of program cost under his control, recognizing that inflation is not one of them.

E. THE FY 1982 RD&A PROGRAM

1. Strategic Programs

The driving factor in our strategic programs is the major Soviet buildup of strategic forces through the 1970s. The growth in Soviet strategic capabilities will provide them with ICBM re-entry vehicles (RVs) sufficient in both numbers and lethality to place the ICBM component of our strategic TRIAD at risk in a surprise attack. The value of the TRIAD is evidenced by the resistance of the other two components, both now and in the near future, to such an attack. To maintain the TRIAD in the future, we will proceed with the mobile M-X program to restore the survivability of the ICBM component; we will also continue with our planned modernization of the other two components. In FY 1982, we will continue full scale development of the M-X system, including the missile and its associated basing mode. Survivability, the unique feature which M-X brings to our ICBM force, underlies both credible deterrence and stability. While there are no technical issues associated with M-X, there remain significant issues relative to the environmental impact of specific basing site selections. The draft Environmental Impact Statement was released in late December, with the 90 day public review period continuing through the first quarter of 1981. In addition to M-X, which will achieve Initial Operational Capability (IOC) in 1986, we will continue to deploy the Mark-12A on MINUTEMAN III ICBMs. We are also improving the flexibility and connectivity of our MINUTEMAN Airborne Launch Control Centers (ALCC).

The SLBM force continues to be our most survivable TRIAD element. The modernization program underway will provide assurance that this survivability will endure. The TRIDENT I missile provides greater range, hence greater operating area to complicate an enemy's anti-submarine warfare (ASW) search. The TRIDENT I (C-4) SLBM has already been backfitted into the first five POSEIDON SSBNs; the remaining seven will be completed by the end of FY 1982. The TRIDENT submarine, with improved quieting, will provide even greater resistance to future acoustic ASW threats. It will also provide the capability to support a follow-on to the TRIDENT I missile. We have started development of such a follow-on SLBM, retaining the option to deploy, in the TRIDENT SSBN missile launch tubes, an SLBM with higher accuracy and a larger payload. We are considering a new TRIDENT II missile that would fill the launch tubes, as well as a long C-4 missile exploiting improved technology.

We are improving the reliability and maintainability of the B-52 bomber and are moving ahead rapidly with the Air Launched Cruise Missile (ALCM). The largest B-52 improvement effort is in the offensive avionics, to interface with the ALCM and SRAM, improve weapon delivery and reduce support costs. The FY 1982 ALCM procurement program provides 440 missiles, with first alert capability in September of this year.

We are proceeding with a vigorous study to examine future alternatives to the B-52, including B-1 and FB-111 derivatives, and a new high technology aircraft based on low observable technology. We are convinced that the continuing low observable programs offer great promise for a future manned bomber. However, a future bomber must be considered not only in the role of a strategic penetrator, but also in the broader context of worldwide force projection and cruise missile carrier missions. These missions involve varying demands on performance (e.g., the strategic mission is most demanding on penetration capability), and schedule (e.g., the B-52 will function as a cruise missile carrier for some time to come). The decision on an appropriate development program should be based on an assessment of the most critical performance needs, schedule, and the compatibility of the supporting low observable technology. Any consideration of a new bomber must also address funding levels consistent with other high priority strategic programs such as M-X, TRIDENT II, and ALCM.

Our strategic command and control capability will be structured to provide the survivability and endurance required by our strategic forces under the "countervailing strategy." The system must provide survivable, jam-resistant and secure means of communication between the National Command Authorities and the strategic forces, with improved post attack endurance. Key efforts include acquisition of the E-4B, an improved Advanced Airborne Command Post which will provide an initial, austere capability in March of this year; development of command, control and communications for the M-X missile force; improving the survivability and endurance of the World-Wide Military Command and Control System (WWMCCS); improvements in strategic satellite communications (AFSATCOM); and both upgrading and expansion of the TACAMO aircraft fleet to improve communications with our SSBN force.

Because our strategic offensive forces bear the principal burden of deterrence, our defensive programs have generally been structured to provide a limited, but meaningful level of activity to provide effective options should they be needed in the future. They also provide the surveillance and warning capabilities essential to characterize and react to an attack should deterrence fail. Our BMD technology provides the options to deploy various BMD alternatives in the future should we deem it necessary. We are developing and demonstrating new sensors and guidance techniques for a layered defense concept using homing interceptors in the exoatmosphere and Low Altitude (LoAD) interceptors in the lower atmosphere. Our air defense will continue to rely on a variety of dedicated active and Air National Guard squadrons, augmented with additional tactical fighters as needed. In crisis and wartime, we will augment ground-command-and-control of the air defenses. We are developing a radar for the Alaskan Air Command which could be used to replace the DEW line radars, and are testing an Over-the-Horizon-Backscatter (OTH-B) system. Programs for warning and detection include survivability enhancements for our satellite early warning system and attack characterization improvements to the BMEWS, PARCS, and PAVE PAWS ground-based radars. While we have stated our preference for verifiable limitations on anti-satellite (ASAT) systems, we are proceeding with development of an ASAT capability, and are pursuing technology to reduce the vulnerability of our satellites to the existing Soviet ASAT capabilitiy.

2. Tactical Programs

The main objectives of our tactical programs are to maintain the military balance in Central Europe in both conventional and tactical nuclear warfare capabilities and to be ready to exert a stabilizing influence in other areas of the world that are deemed to be of vital interest to the US. Our program strategy takes into account the contributions of our Allies and the need for balance among modernization, readiness and sustainability.

We are emphasizing technologies that increase the battlefield effectiveness of our tactical warfare systems by increasing mobility, self-protection capability, and reliability. Developmental tactical surveillance, reconnaissance, and target acquisition systems such as SOTAS (a heliborne radar), the Reconnaissance Surveillance and Target Acquisition Helicopter with Mast Mounted Sight, REMBASS (battlefield sensors), and the Remotely Piloted Vehicle will provide the field commander with timely and accurate information on the deployment of opposing forces.

Close combat capabilities will be substantially improved as the XM-1 tank enters service; the IOC for the XM-1 with the 105mm gun is planned for January of this year. Future capabilities will be advanced as we proceed from development to procurement of the VIPER light anti-tank weapon, the Advanced Attack Helicopter, the HELLFIRE missile, the Fighting Vehicles (IFV/CFV), and a high mobility multi-purpose wheeled vehicle. Fire support programs such as the COPPERHEAD precision-guided projectile and the Multiple Launch Rocket System (MLRS)--both of which will be well into production in FY 82--will provide complementary weapons that, in combination, will improve our capability to counter massed armor attacks. Our family of air defense equipment will be upgraded with several new systems: the PATRIOT and STINGER missile systems and the DIVAD gun.

Considerable modernization effort continues in the air warfare area. The Air Force aircraft modernization program is now well under way and the Navy/Marine Corps aircraft modernization is beginning. Continued procurement of the F-14, F-15, F-16, and F/A-18, coupled with production of the AIM-7M SPARROW, AIM-9M SIDEWINDER, and AIM-54C PHOENIX missiles will maintain our current advantage in air superiority. Development of the new Advanced Medium Range Air-to-Air Missile (AMRAAM) is aimed at sustaining that advantage in the future, providing the capability to attack multiple targets beyond visual range. We are also working to close enemy airfields with programs designed to crater runways and slow their repair. Continued development of the AV-8B as well as continued procurement of the F-16 and F/A-18, along with procurement of a 30mm gun pod, Imaging Infrared MAVERICK, and the development of the LANTIRN designator pod and the Wide Area Anti-Armor Munitions will improve our ability to support ground forces in defeating massed armor attacks. A series of demonstrations this year will clarify a number of technical issues concerning the Assault Breaker anti-armor submunition and the associated target acquisition system; we plan to enter engineering development of the Corps Support Weapon System in FY 82. We are also developing improved standoff weapons, for example, the conventionally-armed land attack TOMAHAWK (TLAM-C), the Medium Range Air-to-Surface Missile (MRASM), and the GBU-15. These weapons can attack high value targets (including airfields) and reduce aircraft attrition.

Programs in Naval Warfare will improve our ability to protect shipping, support allies and overseas forces, and conduct offensive operations at sea. The greatest threat is posed by anti-ship cruise missiles air launched from long-range, land-based aircraft such as the Backfire bomber. To counter this threat, we are improving all components of our AAW "defense in depth." We also have a carefully focused program of ASW development to counter the advancing, significant submarine threat. We are continuing the cooperative development of the Advanced Lightweight Torpedo and programmed improvements to the P-3C and S-3. Improved fleet air defense will be provided by accelerated procurement of AEGIS ships, along with the improved SM-2 missile to provide longer range intercept and improved lethality. Short range defense will be improved with continued procurement of the Phalanx gun system. Responding to the surface threat requires that we continue with the TOMAHAWK and PENGUIN anti-ship missiles for long and short range application. We are continuing procurement of FFG-7 patrol frigates, the SSN-688 Attack Submarine, the LSD-41 Amphibious Landing Ship, and a rescue and salvage ship, the ARS. We are developing designs for a new attack submarine as a follow-on to the SSN-688. Mine warfare improvements will be provided by the MH-53E helicopter for minesweeping and the CAPTOR mine, the Quickstrike family of shallow-water bottom mines, and the conversion of the MK 37 torpedo into a standoff submarine-launched mobile mine.

Our emphasis concerning Theater Nuclear Forces (TNF) is on improvement of flexibility, security, and survivability of short and medium-range weapons and the acquisition of new long-range systems to counter the increasing capability of the Soviet forces to attack Western Europe with long-range nuclear weapons launched from the Soviet Union. To modernize our battlefield systems, we will continue to produce LANCE warheads, maintaining the option for inclusion of an enhanced radiation (ER) feature. We are entering production of a new 8" artillery round. We have initiated R&D on the Corps Support Weapon System, a dual capable system, which could replace the current LANCE in the late 80s. To upgrade our long-range TNF we are initiating procurement of both the Pershing II and the Ground Launched Cruise Missile (GLCM). Both systems, planned to begin deployment in late 1983, will provide the capability to reach the Soviet Union from NATO Europe with high accuracy warheads capable of striking the hardest targets while minimizing collateral damage.

In the mobility mission area, we are pursuing a program that balances our capabilities in airlift, sealift, and pre-positioning of equipment and supplies on land and at sea. Development of the new C-X out-size airlift aircraft, procurement of the KC-10 general purpose tanker, modification of the C-5A wing, stretching the C-141 and the CRAF modification program will lead to improved worldwide strategic airlift capability. Our tactical mobility will be enhanced through modernization and modification of the CH-47 for the Army. In addition, we continue to procure the CH-53E heavy lift helicopter for the Navy and Marines and have begun development of the HXM, a new Marine medium helicopter. The response of our sealift forces will be improved by procurement of multi-purpose mobility ships and conversion of existing roll-on/roll-off ships which will be used to forward deploy equipment. We also plan to convert existing SL-7 container ships to a roll-on/roll-off configuration.

Theater and Tactical Communications, Command and Control Programs emphasize achievement of survivable worldwide force management capabilities; detection, location, and classification of enemy forces; and improved tactical command and control systems that are interoperable among our Services and allies. Improved mobility for theater command and control will be provided by development of a deployable modular Joint Crisis Management Capability (JCMC). Continued deployment of the E-3A along with the E-2C HAWKEYE, and improvements in intelligence support to NATO will, in combination, enhance our theater surveillance and reconnaissance capabilities. Further improvements will be obtained with production of the TR-1, development of improved airborne radars (e.g., PAVE MOVER), the Precision Location Strike System (PLSS), and the future development of the Joint Tactical Fusion System. Improvements in theater and tactical data communications will result from the development of the Joint Tactical Information Distribution System (JTIDS). Command terminals for US AWACS aircraft have entered production, with follow-on application for Air Force and Navy fighters, ships and ground forces. Communication systems with greater reliability and survivability will permit us to make better use of forces; specific programs include the Ground Mobile Force Satellite Communications, Joint Tactical Communications (TRI-TAC) and the SINCGARS VHF Combat Net Radio. Special attention is being focused on upgrading our electronic warfare capabilities, including self-protection systems against Soviet air defense systems and command, control and communication jammers.

3. The Science and Technology Program

The DoD Science and Technology (S&T) Program is the key to maintaining our technological leadership and providing an offset to the numerical superiority of Soviet forces. It includes Research, Exploratory Development and Advanced Technology Development. Our funding request for FY 1982 provides for real growth of nearly 9 percent in this portion of our RD&A program.

Primary efforts are being focused on a set of high-leverage efforts such as:

- Very High Speed Integrated Circuits (VHSIC). The VHSIC Program is a five-year, major technology effort with a total funding of approximately $225 million. The program is designed to accelerate the development of advanced technology for integrated circuits and to provide for the insertion of VHSIC products into high priority military systems.

- Energy R&E Program. The DoD Energy Program is directed to reduce the dependence of DoD activities on foreign oil imports through the future use of domestic synthetic fuels, improved designs to conserve energy and the use of other fuel and energy sources.

We plan to develop specifications for and demonstrate the use of synthetic fuels developed under Department of Energy (DoE) programs. We are developing new engines capable of using a broader range of fuels, and are accelerating the evaluation of several liquid hydrocarbon fuels (derived from low-quality petroleum crudes, oil shale, and coal) for use in military turbine engines.

- Adverse Weather Precision-Guided Munitions (PGM). Our PGM technology efforts will continue emphasis on the development of an autonomous adverse weather capability to counter numerically superior armor, reduce launch platform vulnerability and improve the probability of killing engaged targets. A concentrated effort on target signature characterization for millimeter wave (MMW) seekers is now moving forward, and a joint cooperative infrared and millimeter wave measurements program has just been completed with Germany. Capitalizing on recent technical advances in solid state electronics technology, the Services have joined in an effort to demonstrate cost effective adverse weather seekers against land and sea targets. Both synthetic aperture radar and millimeter wave seekers will be evaluated beginning with a captive flight test demonstration in FY 1981 and FY 1982, and culminating in a free flight demonstration in FY 1983.

- Materials Technology. Composite materials show exceptional promise for improving the capabilities of our aircraft, missiles, and spacecraft, because of their outstanding structural and thermal efficiency. Most composites are made from raw materials available in the United States in large quantities, unlike some of the metals they will replace. Furthermore, their properties and fabrication methods permit simpler designs with lower manufacturing costs. Tri-Service/DARPA development of metal matrix composite (MMC) materials is proceeding on schedule; it appears increasingly likely that the use of MMC materials will eventually rival that of fiber reinforced plastic composite materials. In FY 1982, we plan to move vigorously into the new area of rapid solidification technology (RST) materials. This new technology can make possible very high quality, novel families of aluminum and titanium alloys as well as previously unobtainable high temperature superalloys for gas turbine engines. Results from our modest investments thus far justify a substantial long term commitment by the DoD.

- Manufacturing Technology. This program will continue developing techniques to reduce the unit production cost of DoD weapon systems by increasing productivity. In FY 1982, the program goals include reducing gun tube cost, conserving critical materials, reducing sonobuoy manufacturing cost and salvaging costly "scrap" fuel additives in propellants. We plan to increase emphasis on programs related to overhaul and maintenance activities and to initiate a major thrust to reduce shipbuilding and overhaul costs.

- Aeronautical Technology. We are embarking on a major thrust to integrate electronics and the airframe in order to achieve a significant improvement in the combat capability of tactical aircraft. Fire control information will be used to automatically or semi-automatically assist the pilot by providing the capability to conduct a maneuvering approach to launch air-to-ground weapons, thereby improving delivery accuracy and increasing survivability against ground defense. Recent simulator studies have shown that application of these concepts results in a 2-to-1 increase in weapon delivery accuracy for both air-to-air and air-to-surface weapons, and up to a 10-to-1 increase in survivability during air-to-surface weapon delivery.

- Embedded Computer Software Technology. A new initiative that will provide an order of magnitude improvement in software programming productivity and reliability was initiated in FY 1980. We have now established a tri-Service coordinating committee and identified qualified industry and university participants. New concepts and methods will be sought as a basis for advances in software to complement the rapid progress in computer hardware which is expected to result from our VHSIC program. This initiative will build upon Ada, a high order language which has now been standardized by DoD. Applications of new software technology to command, control, and signal processing functions are planned for the second phase of the program.

4. Defense-Wide Support Programs

Defense-wide C^3I programs are designed to enhance US operations worldwide by developing systems that provide a tie between decision-making elements elements and operating elements in support of both strategic and general purpose forces. Improvements are being made to our intelligence capabilities in areas such as the Consolidated Cryptologic Program, the General Defense Intelligence Program, and Intelligence support to Tactical Forces. Mapping, Charting and Geodesy will provide information essential to navigation of our future weapons (e.g., ALCM, M-X). Future navigation and position-fixing capabilities will be substantially enhanced by continuing development of the NAVSTAR Global Positioning System and associated user equipment. Greater communications capacity, reliability and survivability will be provided by development of ground equipment and satellites for the Defense Satellite Communications System. Other communications efforts, such as the Secure Voice Improvement Program and the Digital European Backbone, will improve security, increase interoperability, and improve reliability and maintainability. Procurement of equipment from the FRG for the European Telephone System will assist in reducing the labor intensive operation and maintenance required for the present system.

Other defense-wide support activities includes those efforts which provide support to multiple defense missions and cannot be allocated directly to any other major mission area. The test and evaluation program continues to emphasize the improvement of reliability and reduction of the vulnerability of our weapon systems. Other activities include space launch and orbital support, global military environmental support, studies and analyses, and general management support.

The manned, reusable Space Shuttle, being developed under management of the National Aeronautics and Space Administration (NASA), will support all aspects of our national space program, including national defense requirements. To exploit fully its capabilities, we are developing an Inertial Upper Stage for use with the shuttle, a Consolidated Space Operations Center, and we are providing launch, landing and support facilities.

TABLE 1-1

RDT&E FUNDING BY MAJOR MISSION AREA
($ Millions)

	FY 81 (FY 81 $)	FY 81 (FY 82 $)	FY 82 (FY 82 $)	% Real Change
S&T Program	3,157	3,432	3,739	8.9
Defense Research (6.1)	614	667	716	7.3
Exploratory Development (6.2)	1,940	2,109	2,234	5.9
Adv. Tech. Development (6.3A)	603	655	789	20.4
Strategic Warfare	3,446	3,746	4,358	16.3
Strategic Offense	2,581	2,806	3,256	16.0
Strategic Defense	554	602	616	2.3
Strategic Control	311	338	486	43.8
Tactical Warfare	5,499	5,979	6,758	13.0
Land Warfare	1,030	1,119	920	-17.8
Air Warfare	1,132	1,230	1,377	11.9
Naval Warfare	1,673	1,819	2,022	11.1
Theater Nuclear	364	395	334	-15.4
Theater & Tactical C^3	1,212	1,317	1,786	35.6
Mobility	89	96	319	232.3
Defense-Wide C^3I	1,538	1,672	1,997	19.4
Defense-Wide Mission Support	2,414	2,624	2,988	13.9
Space Launch/Orbital	350	380	439	15.5
Global/Environmental	39	42	62	47.6
Training	34	36	33	-8.3
Studies/Analyses	118	128	151	18.0
Test & Evaluation	1,209	1,314	1,507	14.7
International Coop RDT&E	15	16	18	12.5
Management & Support	648	704	778	10.5
TOTAL	16,054	17,455	19,841	13.7

TABLE 1-2

PROCUREMENT BY DEFENSE PROGRAM CATEGORY (TOA)
($ Millions)

	FY 81 (FY 81 $)	FY 81 (FY 82 $)	FY 82 (FY 82 $)	% Real Change
Strategic Forces	5,194	5,608	6,217	10.8
Aircraft	1,369	1,478	1,714	16.0
Missiles/Weapons	2,135	2,305	2,437	5.7
Shipbuilding	1,180	1,274	1,462	14.7
Other	510	550	603	9.6
General Purpose Forces	31,316	33,814	33,359	-1.3
Aircraft	13,203	14,261	13,744	-3.6
Missiles/Weapons	7,256	7,835	8,414	7.4
Shipbuilding	6,297	6,799	5,168	-24.0
Other	4,556	4,919	6,034	22.7
Intelligence and Communications	3,729	4,026	4,442	10.3
Airlift/Sealift	840	907	1,266	39.6
Guard/Reserve Forces	1,633	1,763	1,348	-23.5
Central Supply/ Maintenance	1,186	1,280	1,212	-5.3
Training, Medical, Other Personnel Activities	572	617	706	14.4
Administration and Associated Activities	98	105	150	42.8
Support to Other Nations	382	412	364	-11.6
TOTAL	44,951	48,534	49,065	1.1

II. NET BALANCE--MILITARY EQUIPMENT AND TECHNOLOGY

A. INTRODUCTION

This section focuses on comparing the acquisition of military equipment and underlying technology. Other factors such as: the strength of the economic and industrial base; the strength and dependability of allies: the skills, training and morale of military personnel and their leadership remain important to the balance of power. But the development and production of military equipment remains fundamental to the long term strength of our armed forces, and in itself provides a visible component of deterrence.

The balance of equipment between the Soviet Union and the United States has gradually changed over the past decade. The Soviets have historically emphasized the acquisition of large quantities of relatively simple military equipment. Producibility, relatively low unit cost, and maintainability have been traditionally associated with Soviet equipment. In contrast we have, by choice, relied more on improved combat capability and qualitative superiority in our weapon systems. More recently the Soviet emphasis has been evolving to place greater emphasis on sophisticated technology; new classes of Soviet weapons systems are becoming more complex, reflecting qualitative improvements, and the unit costs of these systems, not surprisingly, are comparable to counterpart U.S. equipment.

The assessment that follows compares U.S. and Soviet military research, development and acquisition, examining expenditures and investments, the acquisition process, the balance in quantity of military equipment deployed, in production, and under development, and the status of underlying military technology.

B. DEFENSE EXPENDITURES AND INVESTMENT--OVERVIEW

Military needs are accorded top priority in the Soviet Union and are supported by broadly based programs for research, development and acquisition. Continuity of key leaders and major programs leads to a stable program of military expenditures and investment.

Comparisons of expenditures of the United States and the Soviet Union are approximate because of lack of knowledge of the Soviet Union and the great differences in our military and economic structures. We attempt to assess the level of Soviet defense effort by estimating what it would have cost the United States, using U.S. processes, techniques, and management procedures to conduct the Soviet military programs. Using this approach, estimates are developed for what it would cost the United States to produce and sustain a military force with the same size and weapons inventory as that of the USSR. This approach provides a general appreciation for the trends in the magnitude of defense activities in a way that reflects both quality and quantity of military equipment.

This measure contains sources of errors, but they are not great enough to alter the basic conclusion that Soviet defense activities have been substantially larger than those of the United States since the early 1970s. In 1977 we began a planned program to increase our defense expenditures in an effort to correct some of the developing imbalances. We have generally fallen short in this program because the underlying rate of inflation during the past four years has exceeded our projections, thereby eroding much of the planned real growth.

1. Total Defense Expenditures

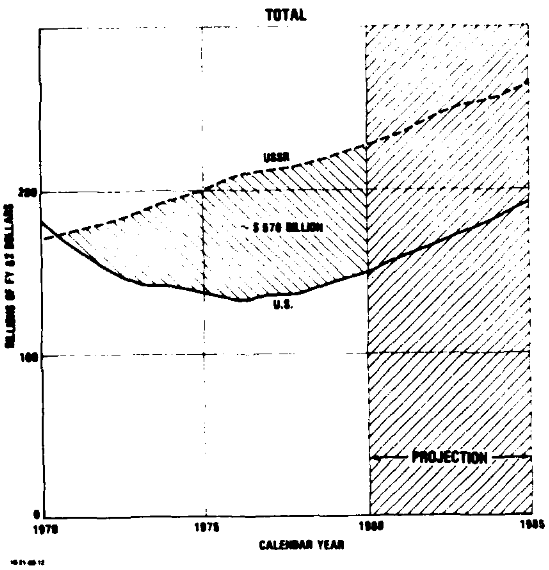
From 1965 until the late 1970s, Soviet defense spending appears to have grown at about the same rate as the economy, absorbing a relatively constant 11 to 13 percent of their gross national product. The 1978-1979 slowdown of the Soviet economy, in combination with maintaining the growth rate of defense expenditures, has resulted in the share of gross national product devoted to the military increasing to 12 to 14 percent. Measured in constant 1982 dollars, the estimated dollar cost of total Soviet expenditures (RDT&E, Procurement, Military Construction, Personnel, Operations and Maintenance) has climbed steadily (Figure II-1a) and is now approximately 50 percent higher than for the United States. The average annual increase has been about 3 percent per year.

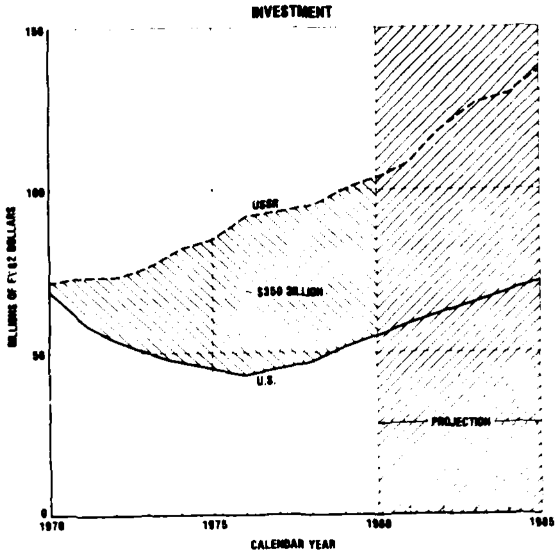
U.S. defense expenditures, in real terms, are returning to the levels experienced in the early seventies and are now increasing at more than 4 percent annually. Our defense expenditures remain at approximately 5 percent of the GNP.

2. Military Investment

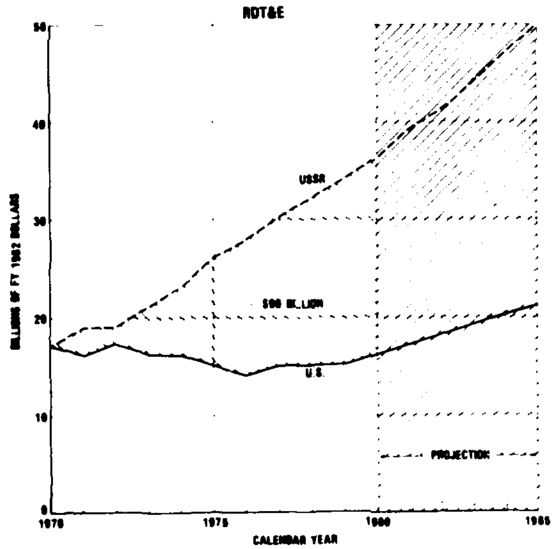
Soviet military investment (Procurement, RDT&E, and Military Construction) measured in constant dollar costs, has continued to grow at the fairly steady rate of 4 percent per year for the past 10 years. (Figure II-1b). Since 1975, U.S. military investment has also increased by about 4 percent annually, although it declined in the first five years of this decade.

The estimated total annual dollar cost of Soviet military investment programs has exceeded that for U.S. defense programs since about 1970, and in 1980 exceeded the U.S. effort by 80 percent. The cumulative disparity in investment for the decade 1971-80 is approximately $350 billion in 1982 dollars. This is much higher than the estimate presented last year ($240 billion in 1981 dollars) and reflects both improvements in the preparation of the estimates and the addition of the substantial difference that results from moving from 1970-1979 inclusive to 1971-1980.





NOTES: (1) Includes RDT&E, Procurement and Military Construction
(2) Includes non-DoD-funded defense programs.



NOTE: Includes non-DoD-funded defense programs

FIGURE II-1. Military Expenditures: A Comparison of U.S. Military Expenditures with Estimated Dollar Costs of Soviet Expenditures (excluding retirement pay)

Soviet investment continues to pay off in terms of improved R&D capabilities and weapon systems. Key developments that have been demonstrated in recent years include more accurate ICBMs, improved SLBMs and IRBMs, new interceptors and tactical aircraft, new tactical and strategic SAMs, new armored vehicles, look-down/shoot-down and other pulse doppler radars, an airborne warning and control system, new electro-optical systems, high-speed and deeper diving submarines, aviation-capable ships, new ships for open-ocean anti-submarine warfare (ASW) and anti-ship missions, and improved electronic warfare capabilities.

3. RDT&E

There is considerable uncertainty in estimates of the dollar costs of Soviet military RDT&E. There are such substantial information gaps and differences between the USSR and U.S. in the manner of conducting scientific research that the significance of outlay comparisons is difficult to interpret unless focus is maintained on trends over time. Derived from a variety of sources, estimates of Soviet military RDT&E dollar costs show that the Soviets have exceeded the U.S. in the ten years 1971-1980 by about $90 billion (1982$). In 1980, the dollar cost of Soviet RDT&E activities was about twice as much as comparable U.S. outlays (Figure II-1c). Although there is substantial uncertainty in the absolute value of Soviet RDT&E expenditures, the trend is significant. Without a U.S. response this persistent emphasis is sure to diminish our technological superiority and create a major risk of technological surprise.

We can project a sustained Soviet commitment to develop a broad range of new weapons, attempting to improve the quality of their systems without significantly decreasing their past emphasis on quantity. An indication of this commitment is the trend toward increasing the share of military outlays devoted to RDT&E (the RDT&E share of military outlays increased steadily over time).

Comparing the output of military RDT&E programs involves a number of measures. One measure is the number of new weapons and major modifications that are introduced each year. Figure II-2 gives the number of a comparable set of strategic and tactical weapons introduced each year.

C. THE WEAPONS ACQUISITION PROCESS

Throughout their existence the Soviets have been preoccupied with the development of military power. Even from before World War II the Soviet Union accorded top priority to the acquisition of large quantities of military weapons. The result is a large, stable weapons development bureaucracy that produces a regular progression of weapon designs and prototypes.

The large and durable supporting bureaucracy, its design institutions, industrial ministries and production facilities gradually increase in size. The overall weapon acquisition process is characterized by stability and continuity. For major weapon types multiple design bureaus and producers are established and maintained. Employment and level of activity at such major RD&A installations remain stable and thus the level of skill and experience increases over time. Such stability facilitates long-range planning and the application of resources to meet long-range goals.

But there are also disadvantages associated with this built-in inertia. Once a decision is made to produce a system for deployment, it tends to be final. Thus, as the Soviets commit more and more resources to a given funded effort, it tends to gain momentum. If carried to an extreme, the result can be--and has on occasion been--inefficiency and

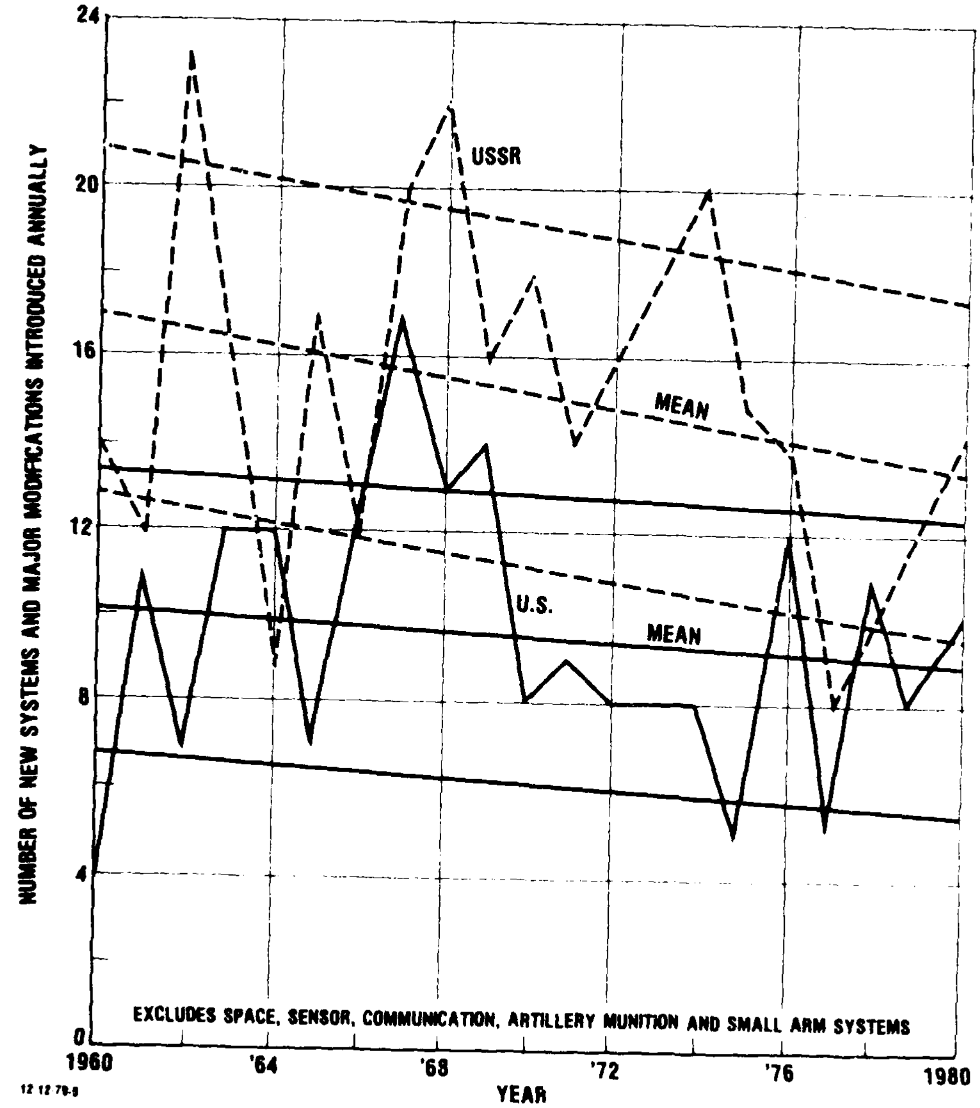


FIGURE II-2. A Comparison of Rates of Weapon System Introduction

waste. Further, Soviet development organizations have lower productivity than their U.S. counterparts. Soviet design institutions are hampered by their insularity and the environment of secrecy in which they are forced to operate. They strive for self-sufficiency to avoid dependence on suppliers. In most cases, there is a bureaucratic separation between research institutes, design bureaus, and production facilities.

More often than not, however, the consequence of their long-term commitments to development and deployment programs is on-schedule, high-volume production--using a relatively low technology industrial base--of equipment that is both fieldworthy and exportable.

For many years the general view of the Soviet weapons development process has been that unlike the U.S. they emphasize production of large quantities of relatively simple, single-purpose systems which are reliable and fairly easy to maintain in combat. Improvements in performance were accomplished by progressive modifications. Now it is evident that this philosophy has been joined by the capability to introduce innovative programs involving advanced technology conducted for extended periods (more than ten years). On the other hand, the U.S. is making more extensive use than formerly of progressive modernization and incremental programs.

This recognition increases our concern that the Soviets will surpass U.S. deployed weapon capability in selected categories. A further consequence is that Soviet unit costs are increasing in a fashion comparable with costs for their U.S. counterparts. The result may be reduction of the quantities acquired by the Soviets.

The strength of U.S. military R&D lies in the technical competence, productivity and competitive incentives of American industry. Competition and relatively open debate throughout the entire U.S. acquisition cycle encourages identification and development of the best ideas and end products. The result is a tendency to innovate and press for maximum performance, sometimes at the expense of program cost and schedule.

D. THE BALANCE OF MILITARY EQUIPMENT

1. Strategic Forces

Over the ten year period 1971-1980, the estimated cumulative dollar costs of Soviet strategic force procurement exceeded that of the U.S. by about $95 billion which is 50 percent more than total U.S. procurement for strategic forces for the same period. The trends are shown in Figure II-3. As a result of the major U.S. strategic modernization program initiated in the late 1970s, U.S. procurement outlays are now increasing.

U.S. and Soviet strategic systems deployed as of January 1981 are shown in Table II-1.

a. Strategic Offense

These forces consist of intercontinental ballistic missiles (ICBM), submarine-launched ballistic missiles (SLBM) and the associated submarines, and intercontinental bombers.

(1) Deployed Equipment

The Soviets devote primary emphasis to their ballistic missile force, whereas the U.S. force is structured around a roughly balanced force of ICBMs, SLBMs, and bombers. The dates of introduction of

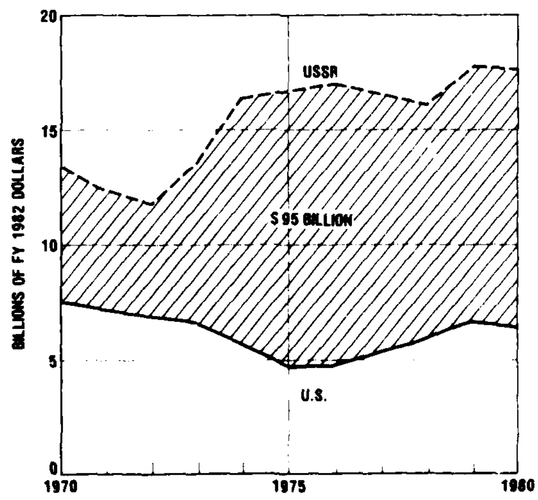


FIGURE II-3. Strategic Forces: A Comparison of U.S. Procurement Costs with Estimated Dollar Costs of Soviet Procurement

TABLE II-1. DEPLOYED STRATEGIC SYSTEMS
(1 January 1981)

SYSTEM	QUANTITY (FORCE LEVEL) U.S.	USSR	QUALITY
OFFENSE			
ICBM LAUNCHERS[1,2]	1,054	1,398	EQUAL
SLBM LAUNCHERS[1,3]	624	950	U.S. LEAD DIMINISHING
LONG-RANGE BOMBERS[4]	413	156	U.S. LEAD DIMINISHING
DEFENSE[5]			
EARLY WARNING			
SATELLITES	3	0	U.S. LEADS, NO EFFECTIVE USSR SYSTEM DEPLOYED
RADARS	55	8	U.S. LEAD DIMINISHING
SURVEILLANCE SYSTEMS	60	1,200	
INTERCEPTORS	327[6]	2,600	U.S. LEADS
SAM LAUNCHERS	0	10,000[7]	USSR LEADS, NO U.S. SYSTEM DEPLOYED
ABM DEFENSE LAUNCHERS	0	32	USSR LEADS, NO U.S. SYSTEM DEPLOYED

[1]Includes on-line missile launchers as well as those in construction, in overhaul, repair, conversion, and modernization.

[2]Does not include test and training launchers, but does include launchers at test sites that are thought to be part of the operational force.

[3]Includes launchers on all nuclear-powered submarines and, for the Soviets, operational launchers for modern SLBMs on G-class submarines. An additional 39 launchers on G-*II* are not accountable under SALT.

[4]Includes about 65 FB-111s and 65-70 BACKFIRES assigned to long-range aviation. Includes deployed strike-configured aircraft only.

[5]Excludes radars and launchers at test sites or outside CONUS.

[6]Can be augmented by F-14 and F-15 aircraft from TAC.

[7]These launchers have a total of 12,000 missile rails.

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the U.S. and Soviet ICBMs are summarized in Table II-2. Table II-2 also shows the Soviets have deployed three new ICBMs in the mid-to-late 1970s.

U.S. SLBM operational forces include 36 submarines carrying 576 SLBMs with a total of over 4500 reentry vehicles.

The Soviet SSBN force includes 62 submarines carrying 950 modern SLBMs with a total of less than 2,000 reentry vehicles (see Table II-3). The SS-N-8 and the SS-N-18 permit the Soviets to hit targets in the U.S. from their home ports.

TABLE II-2. DATES OF ICBM INTRODUCTION
AND NUMBER OF LAUNCHERS

U.S.			USSR		
ICBM LAUNCHERS	IOC	FORCE LEVEL	ICBM LAUNCHERS	IOC	APPROXIMATE 1980 FORCE LEVEL
TITAN II	1961	54	SS-6	EARLY 1960s	–
MINUTEMAN I	1962	0	SS-7	EARLY 1960s	–
MINUTEMAN II	1966	450	SS-8	EARLY 1960s	–
MINUTEMAN III	1970	550	SS-9	LATE 1960s	ABOUT 10
			SS-11	LATE 1960s	ABOUT 580
			SS-13	EARLY 1970s	ABOUT 60
			SS-16	MID-LATE 1970s	–
			SS-17	MID-LATE 1970s	ABOUT 150
			SS-18	MID-LATE 1970s	OVER 300
			SS-19	MID-LATE 1970s	OVER 300
TOTAL		1,054			1,400

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TABLE II-3. DATES OF SLBM INTRODUCTION
AND NUMBER OF LAUNCHERS

U.S.			USSR		
SLBM*	IOC	1980 FORCE LEVEL	SLBM	IOC	1980 FORCE LEVEL
POLARIS A-1	1959	0	SS-N-4	EARLY 1960s	
			SS-N-5	EARLY 1960s	
A-2	1962	0	SS-N-6	LATE 1960s	
A-3	1964	80	SS-N-8	EARLY 1970s	
POSEIDON C-3	1971	416	SS-NX-17	LATE 1970s	
C-4	1979	80	SS-N-18	LATE 1970s	
TRIDENT C-4	1982	0	SS-NX-20	EARLY 1980s	
TOTAL		576			950

*Three former SSBNs have been converted to SSN and launchers deactivated

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The air-breathing element of our strategic TRIAD includes B-52 long-range bombers and FB-111 medium bombers (each capable of delivering both gravity bombs and Short Range Attack Missiles), and KC-135 tankers. Presently deployed Soviet long-range bombers include the BEAR and BISON, both introduced in the mid-1950s. 65-70 BACKFIRES are now deployed with Soviet Long Range Air Forces. These aircraft probably have both peripheral and intercontinental attack missions. Both the BEAR and the BACKFIRE can carry one or two air-to-surface missiles with a range of from 500 to 700 kilometers.

Since 1970, the estimated cumulative dollar costs of procuring all of these Soviet intercontinental attack forces exceeded comparable U.S. outlays by about 85 percent. In 1980, the estimated Soviet dollar procurement costs exceeded U.S. outlays by 55 percent (see Figure II-4).

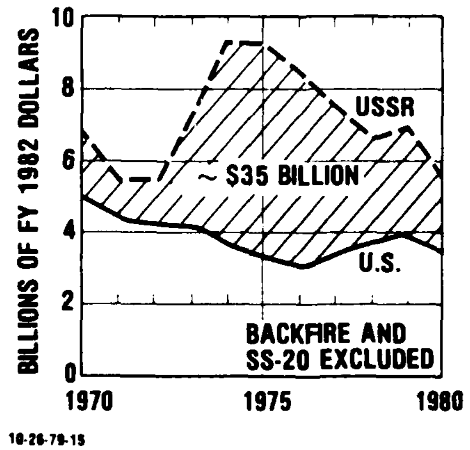

FIGURE II-4 . Strategic Intercontinental Forces: A Comparison of U.S. Procurement Costs with Estimated Dollar Costs of Soviet Procurement

The average age of U.S. and Soviet strategic offensive forces are compared in Figure II-5.

A comparison of the procurement costs for each of the ICBM, SLBM, and bomber forces is shown in Figure II-6. The estimated cumulative dollar costs of Soviet ICBM procurement for the 1971-80 period were nearly three times the corresponding U.S. outlays. For the SSBN/SLBM force, Soviet procurement costs were over twice the corresponding U.S. outlays,

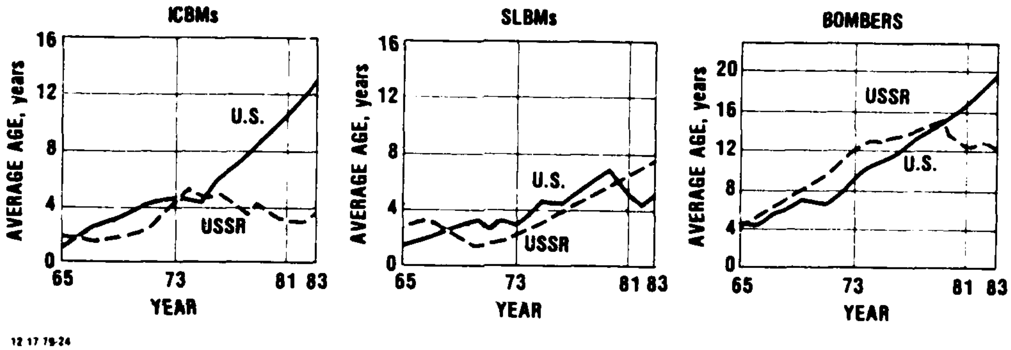

FIGURE II-5 . Strategic Intercontinental Forces: Average Age

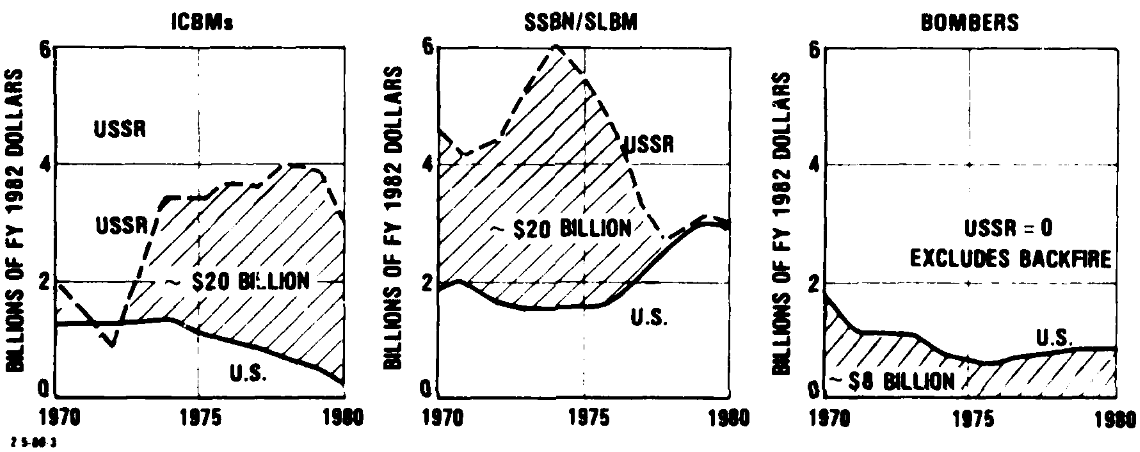

FIGURE II-6 . Strategic Intercontinental Forces: A Comparison of U.S. Procurement Costs with Estimated Dollar Costs of Soviet Procurement although by the decade's end, costs were approaching equality. For the intercontinental bombers (which includes related tanker systems and air-to-surface missiles), U.S. procurement outlays exceeded the estimated dollar costs for the Soviet Union for 1971-80 by over $8 billion.

(2) Development and Production

The U.S. completed production of MINUTEMAN III in December 1978 and does not currently possess an ICBM production line. However, we are currently converting 300 MINUTEMAN III missiles to carry the more accurate higher yield Mark 12A reentry vehicles. Our major engineering effort is to develop and deploy the M-X missile in a survivable basing mode. Its IOC is scheduled for the mid-1980s. An enhanced Airborne Launch Control System (ALCS Phase III) for MINUTEMAN is under development.

The Soviet design bureaus have produced a regular procession of new ICBMs. Development programs for new or modified ICBMs are underway. Deployment of the fourth generation Soviet ICBMs, each capable of carrying MIRVed payloads is virtually complete. Greatly improved accuracies are estimated for the SS-18 and SS-19. The Soviets also are proceeding with development of their fifth generation ICBM systems.

U.S. production of SLBMs ceased after 1975 but was resumed last year when the backfit of 12 POSEIDON submarines with the longer-range TRIDENT I missile began. TRIDENT submarines, each with 24 missiles, will be coming into service in 1982. Eight TRIDENT submarines are expected to be deployed by the middle of this decade.

The Soviets continue to expand and modernize their SLBM force. They are developing the new 20-tube very large TYPHOON SSBN. In the last seven years, the USSR has produced 30 SSBNs; the U.S. has launched one TRIDENT SSBN which is not yet operationally deployed.

Fragmentary evidence suggests at least two new Soviet strategic aircraft may be under development. The BACKFIRE bomber which is replacing BADGER aircraft is being deployed with Long Range Aviation and Soviet Naval Aviation units at the rate of 30 per year.

The Soviets appear to be developing a long-range, air-launched cruise missile. Our ALCM program will provide the most significant improvement to our strategic bomber force as we achieve IOC in late 1982. The ALCM will sustain the capability to penetrate Soviet air defenses, with the accuracy necessary to place even the hardest targets at risk. These weapons will ultimately be loaded both externally and internally on our B-52G bombers, roughly doubling the number of weapons carried by these aircraft.

b. Strategic Defense

One purpose of strategic defense is to enhance the survivability of strategic offense systems. The Soviets continue to emphasize strategic defensive weapons and forces, whereas the U.S. has essentially eliminated its strategic air defense weapons, emphasizing the warning system needed to posture our retaliatory offensive forces. Estimates of annual procurement costs are shown in Figure II-7. Since 1971 average annual procurement costs for USSR strategic defense were equal to what we spent in the whole ten years.

(1) Deployed Equipment Comparisons

(a) Surveillance and Warning

The U.S. tactical warning and attack assessment system addressed to the air-breathing threat is composed of Distant Early Warning

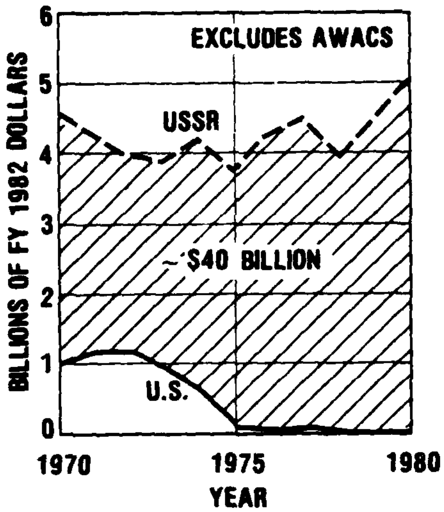

FIGURE II-7. Strategic Defense: A Comparison of U.S. Procurement Costs with Estimated Dollar Costs of Soviet Procurement

(DEW) radars, the Pinetree radar line, elements of the Joint Surveillance System (JSS) and in periods of crisis several E-3A *Airborne Warning and* Control Systems (AWACS). The Soviets have about 1,200 Surveillance Systems; they also have begun to introduce AWACS-type aircraft with a limited surveillance capability over land.

The USSR has already deployed an extensive missile attack warning and satellite tracking radar network employing electronically scanned radars. These programs increase Soviet warning time and improve the ability to determine the size, nature, and targets of a ballistic missile attack. U.S. satellites, BMEWs, PARCs, PAVE PAWs, FPS-85 and FSS-7 radars already in place are effective in performing these same functions.

(b) Interceptors

Aircraft assigned to U.S. continental air defenses include 224 F-106As, 63 F-101Bs and 40 F-4Ds operated by Active and Air

National Guard units. These are augmented by F-15s and F-14s that can be placed on peacetime alert. Both have a look-down/shoot-down capability. The Soviets have a force of about 2,600 interceptors assigned to strategic air defense forces (APVO). They have deployed two new interceptor aircraft types since 1970--MIG-23 FLOGGER and MIG-25 FOXBAT: some of the latter (the modified FOXBAT) are now testing a look-down/shoot-down capability and a new air-to-air missile. As the Soviets extend the deployment of this system they could begin to reduce the significant advantage of bombers flying at low altitude to avoid airborne intercept.

(c) SAMs

The U.S. has no continental strategic defense SAM batteries. We retain the option, however, to deploy CONUS based SAMs in an air defense role if not committed elsewhere. The Soviets still retain the SA-1 system around Moscow and are upgrading its capabilities. They have reduced the size of the SA-2 strategic SAM force; but continue to deploy SA-3 and SA-5 SAMs. The SA-X-10 has now started initial deployment (see Table II-4).

(d) Ballistic Missile Defense (BMD)

The U.S. has deactivated its one ABM facility while the Soviets continue to maintain the Moscow ABM defense complex (formerly 64 launchers of which 32 were deactivated last year). The Soviets have developed and tested an operational anti-satellite (ASAT) system. The U.S. does not have an ASAT system deployed although we are vigorously developing such a capability.

(2) Production and Development Comparisons

(a) Surveillance and Warning

The Soviets have large phased array radars under

TABLE II-4. DATES OF SAM INTRODUCTION AND ESTIMATED NUMBER OF LAUNCHERS

CONTINENTAL U.S.			USSR		
SAM	IOC	1980 FORCE LEVEL	SAM	IOC	1980 FORCE LEVEL
NIKE AJAX	1953	0	SA-1	MID 1950s	10,000
NIKE HERCULES	1958	0	SA-2	LATE 1950s	
BOMARC	1958	0	SA-3	EARLY 1960s	
HAWK	1960	0	SA-5	EARLY 1960s	
			SA-X-10	BEING DEPLOYED	
SAFEGUARD	1975	0	ABM 1	MID 1970s	32

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construction. Several other large radars are under construction in the Soviet Union and are believed to be associated with ballistic missile defense. The Soviets continue to develop and deploy new, more sophisticated radars with better capabilities against low altitude attack. The Soviets are developing a new airborne warning and control system (AWACS) which will extend over water and overland detection and interceptor control capabilities.

The U.S. is improving the reliability and capability of the BMEWs. We plan to deploy OTH-B radars on the east and west coasts to augment our capability to detect air-breathing attacks against the coastal approaches to North America.

(b) Interceptors

Several new interceptors could enter the Soviet APVO in the next decade. In addition to the look-down/shoot-down system on new FOXBATs, this capability is expected to appear on new fighters, and a long-range interceptor with an increased combat radius. We plan to continue procurement of F-14s and F-15s which can be applied to our strategic defensive forces.

(c) SAMs

The Soviet SA-X-10 missile now being deployed is believed to be of somewhat comparable performance to the U.S. PATRIOT system currently under development.

(d) Ballistic Missile Defense

The Soviets have been developing a follow-on ABM system including a high-acceleration missile, somewhat similar to our short-range SPRINT, for 15 years. The U.S. BMD R&D program includes a broad-based advanced technology program to maintain our technology lead over the Soviet Union, and a systems technology program to demonstrate concepts necessary to hedge against future capabilities and uncertainties. Low Altitude Defense (LoAD) is an R&D program to develop options for defense of strategic missile deployments. There are currently no plans to deploy a U.S. BMD system.

(e) Space Warfare

The Soviets are expending sizable resources in R&D for laser and particle beam weapon programs. Such weapons could eventually pose threats to our satellites. Laser systems could damage the optical systems, or destroy the satellite system. While U.S. national policy is to pursue negotiations on ASAT limitations leading to strong symmetric controls, we have placed emphasis on our R&D activities to increase our satellite survivability against attacks, should they occur, and to be able to destroy Soviet satellites if necessary.

The primary U.S. ASAT effort is the development of a high technology interceptor utilizing a miniature vehicle. If carried to deployment, this system will have an IOC in the late 1980s.

2. Theater Nuclear Forces (NATO/Warsaw Pact)

NATO's deterrent strategy and warfighting capabilities depend on its Triad of conventional, theater nuclear and strategic nuclear forces. In the Triad concept theater nuclear forces provide direct defensive capability to supplement the contribution of conventional forces, and at the same time provide a credible linkage to the deterrent capability of U.S. strategic nuclear forces. Theater nuclear forces are frequently classified as short-range, mid-range and long-range. Many theater nuclear delivery systems are compatible with both nuclear and conventional munitions.

The Soviets have undertaken a rapid program of modernization and it has continued unabated in the last year. More long-range SS-20 missiles are being deployed, each with 3 MIRVs. They are also improving their medium- and short-range nuclear firepower with the introduction of the SS-21, SS-22 and SS-X-23 missiles. The Soviets are emphasizing increased range, improved warhead accuracy, better survivability, more flexibility in available options for weapon uses and a larger force size. Although the number of SS-20 missiles on launcher will possibly be lower if the older SS-4 and SS-5 missiles are phased out, the number of independently targetable warheads will greatly exceed the number available in 1975 and the total number of missiles, including reloads, may be significantly higher.

No new long-range, land-based missiles have been introduced by the U.S. into NATO since the early 60s. We are developing the longer range, more mobile and more accurate PERSHING II system and also the Ground-Launched Cruise Missile (GLCM), which is also long-range, mobile, and accurate.

NATO's only recent mid-range system improvement has been the LANCE missile which replaces HONEST JOHN and SERGEANT.

Expected trends in Theater Nuclear Forces (TNF) warheads and launchers are shown in Figures II-8 and II-9.

3. General Purpose Forces

The estimated annual dollar cost for procuring Soviet general-purpose force equipment increased by 40 percent since 1971 (see Figure II-10). Over the period, cumulative Soviet procurement exceeded that of the U.S. by approximately $110 billion.

The Soviet Armies, Frontal Aviation and Navy have all been engaged in a comprehensive program of modernization and expansion.

a. Ground Forces

The extensive Soviet ground force improvement program involves mobility, fire power, armor and CBR protection, shock action, command and control, obstacle crossing capability, air defense, electronic warfare and logistic support. Included in this program are the introduction of:

- New T-72 tanks into Soviet units and some Pact armies.
- New self-propelled 122 and 152 mm weapons replacing older towed artillery.
- New SAMs to replace older gun systems.
- Tropospheric scatter radio relay and communications satellite equipment and increased automation.
- New infantry combat vehicles such as the BMP into motorized and rifle and tank units.

In the recent decade, cumulative dollar estimates of Soviet procurement costs for land force equipment were over three times those for U.S. forces. Although annual Soviet procurement expenditures were only 40 percent higher in 1970, they are nearly two and one-half times as great now (see Figure II-11).

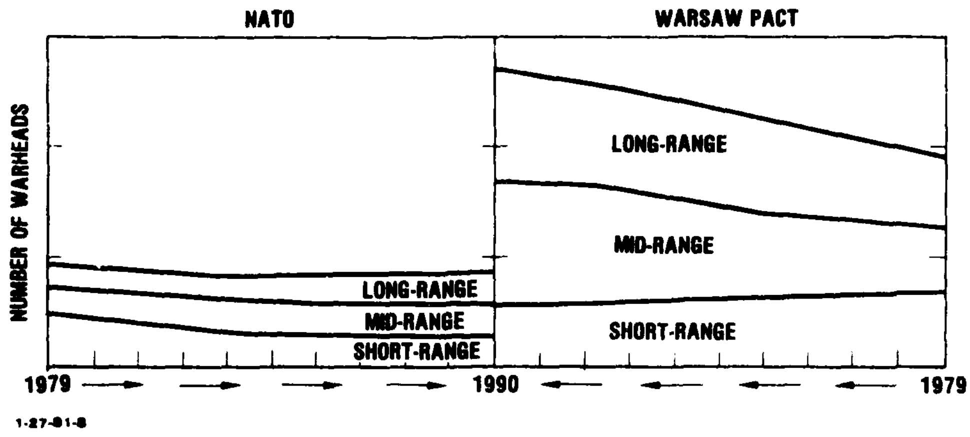

FIGURE II-8. Trends in Theater Nuclear Forces Warhead Balance

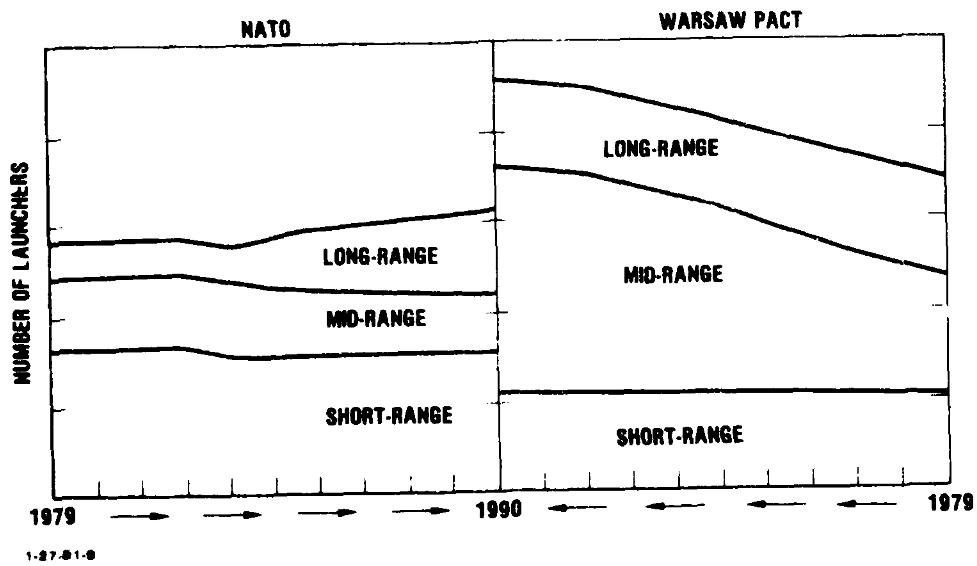

FIGURE II-9. Trends in Theater Nuclear Forces Launcher Balance

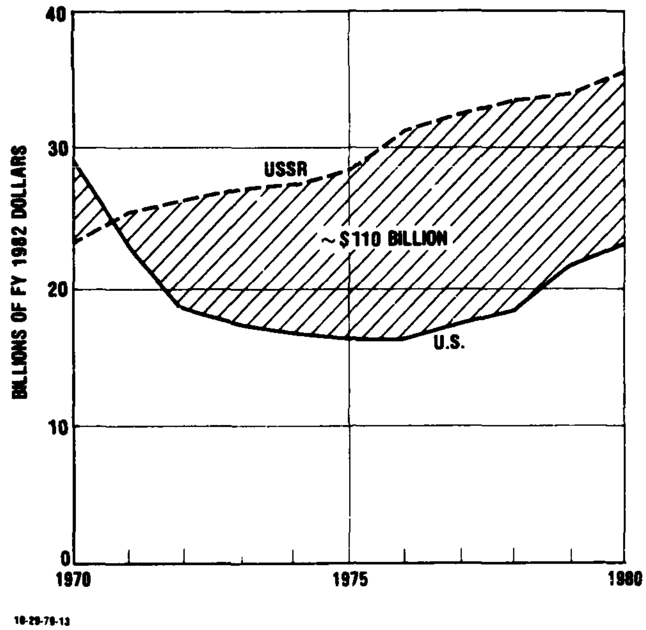

FIGURE II-10. General Purpose Forces: A Comparison of U.S. Procurement Costs with Estimated Dollar Costs of Soviet Procurement

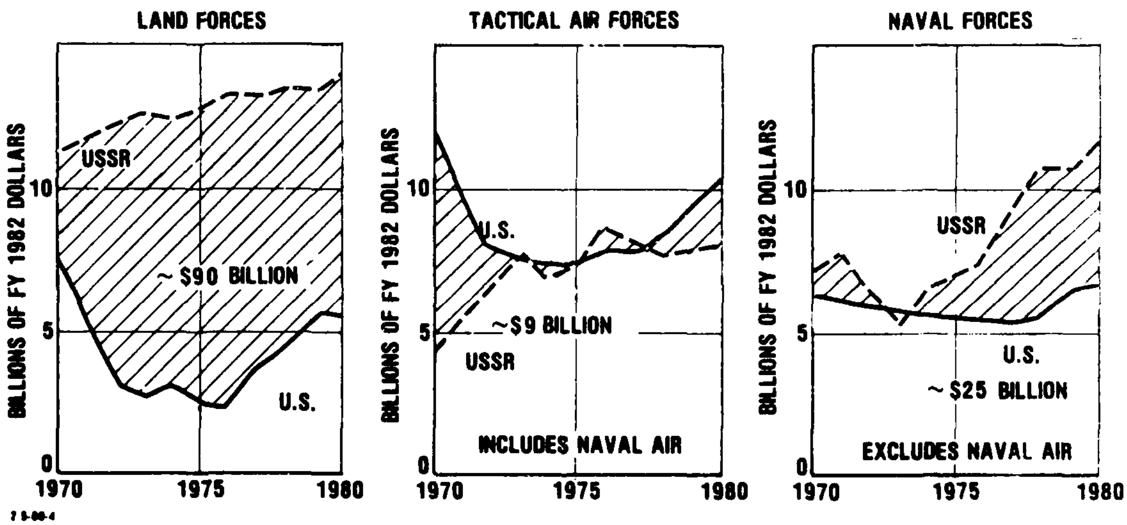

FIGURE II-11. Elements of General Purpose Forces: A Comparison of U.S. Procurement Costs with Estimated Dollar Costs of Soviet Procurement

Deployed equipment in support of NATO and Warsaw Pact land forces is compared in Table II-5. The Warsaw Pact maintains substantially larger numbers of most deployed equipments.

The Soviet Union has further developed its Chemical Warfare capabilities. Warsaw Pact forces are well equipped for CW and routinely practice fighting in chemical warfare environment. Their capabilities include defensive measures deployed on Naval craft and a great variety of offensive-agent delivery systems. NATO forces can be rated as only marginally prepared to survive and operate in a chemical attack, due to production shortages and constraints on deployed equipment.

Annual production ratios are summarized in Table II-6. Soviet tank production has been approximately 2,000-3,000 per year and in recent

TABLE II-5. DEPLOYED LAND FORCE SYSTEMS
(1 January 1981)

WEAPON	WARSAW PACT/NATO RATIOS	QUALITY
TANKS	3:1	USSR T-72 SUPERIOR TO U.S. M60A3
ARTILLERY AND ROCKET LAUNCHERS	3:1	EQUAL
ARMORED FIGHTING VEHICLES	2.5:1	WARSAW PACT LEADS
ANTI-TANK MISSILE LAUNCHERS	1:2.5	EQUAL
SAMs (not man portable)	3:1	EQUAL: PACT LEADS IN MOBILITY. NATO LEADS IN LETHALITY AND ENVELOPE
MILITARY HELICOPTERS	1:1	EQUAL BUT PACT IMPROVING

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TABLE II-6. PRODUCTION SUMMARY OF SELECTED TACTICAL WEAPONS FOR NATO[1] AND WP COUNTRIES

WEAPON	1976-1980 ANNUAL AVERAGE RATIOS		1980 RATIOS	
	USSR/U.S.	WP/NATO	USSR/U.S.	WP/NATO
TANKS	2.5:1	2:1	4:1	3:1
OTHER ARMORED VEHICLES[2]	6:1	3:1	12:1	3:1
ARTILLERY (OVER 100 mm)	20:1	8:1	5:1	2:1
TACTICAL COMBAT AIRCRAFT[3]	2:1	1:1	2:1	1:1
MILITARY HELICOPTERS	3:1	1:1	3:1	1:1
SAMs (NOT MAN-PORTABLE)[4]	17:1	7:1	9:1	5:1
MAJOR NAVAL SURFACE COMBATANTS (OVER 1,000 TONS)	1:1	1:2	1:1	1:2
ATTACK SUBMARINES	3:1	1:1	9:1	2:1

[1]Includes France.

[2]Includes light tanks, infantry combat vehicles, armored personnel carriers, reconnaissance vehicles, and fire-support and air-defense vehicles.

[3]Includes tactical fighter, attack, reconnaissance, electronic warfare, and all combat-capable tactical training aircraft.

[4]USSR and WP figures include SAMs for other countries.

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years well over half have been the new T-72 model. Also, the Soviets have emphasized production of artillery, SAMs and armored personnel carriers and other armored vehicles. Warsaw Pact production of artillery exceeds NATO production by about a factor of eight. In only the categories of tactical combat aircraft and military helicopters does NATO production for its own forces approach that of the Warsaw Pact.

b. Tactical Air Forces

The modernization of all facets of Soviet Frontal Aviation has been dramatic. The entire counterair force has been equipped with new generation aircraft and new precision-guided, air-to-ground ordnance is in development. The ground attack elements are expected to have new generation aircraft by 1984. Frontal Aviation is made up of 4,800 aircraft, with a large number in East Germany, Poland, Czechoslovakia and Hungary. Of the

Soviets' 5,200 helicopters, a number are assigned to Frontal Aviation's attack and transport regiments. It appears that each first line ground army will be equipped with a regiment of attack helicopters. New HIND E helicopters, with greater standoff range and launch-and-leave capability, are replacing the HIND D. The HIP E is probably the most heavily armed helicopter in the world, being configured with machine guns, unguided rockets, bombs, and anti-tank guided missiles.

In the decade 1971-80, the estimated dollar costs for Soviet procurement of tactical air forces (including naval aviation) were roughly $9 billion less than for corresponding U.S. procurement. The current cost estimate for Soviet procurement is slightly lower than the corresponding U.S. outlay. In the last five years tactical combat aircraft produced for the USSR forces (excluding PVO strategic defenses) have comprised primarily FLOGGER, FITTER, FENCER, FISHBED, and FOXBAT. The annual production for U.S. forces has averaged about 350, with an additional 250 produced by our NATO allies.

c. Naval Forces

During the past decade, 1971-1980, estimated dollar costs of Soviet general-purpose naval force procurement have been about $23 billion more than corresponding U.S. outlays, if U.S. multipurpose aircraft carriers and their aircraft are excluded (see Figure II-11). However, U.S. naval force procurement costs exceeded Soviet procurement costs by about $20 billion, if U.S. carriers and their aircraft are included.

One example of the trends in naval forces is that for major surface combatants. In Figure II-12 the number, tonnage, average age and estimated dollar costs for U.S. and USSR cruisers, destroyers and frigates are shown.

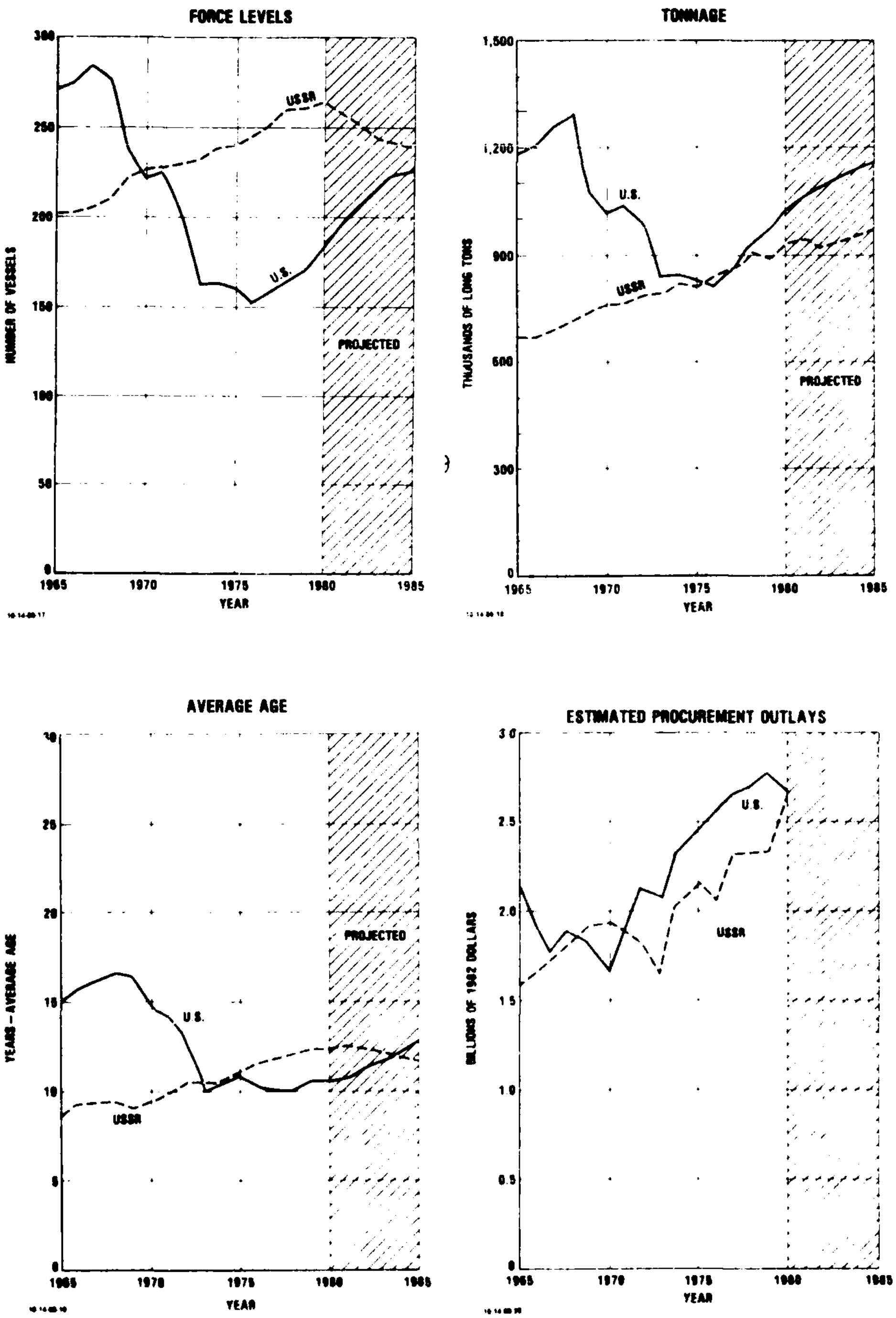

FIGURE II-12. Cruiser, Destroyer and Frigate Forces of the U.S. and USSR

The Soviets have increased their already strong capabilities against aircraft carriers as a result of introduction of the naval version of the BACKFIRE and the continuing inventory expansion of new anti-ship missiles on nuclear-powered submarines and surface combatants. In the past decade, two classes of large air-capable ships--one a guided missile VSTOL aircraft carrier (KIEV class), the other a guided missile carrier (MOSKVA)--have been introduced. These are multi-purpose ships which have capabilities for anti-ship operations. New-design principal surface combatant classes, one nuclear-powered, are under construction and are expected to be outfitted with varieties of new advanced weapon systems. A new aircraft carrier probably nuclear powered and of about 60,000 tons is expected to be laid down in about 1982, although there is no evidence that work on this ship has begun. In any case it is not expected to be operational until the late 1980s.

A key deficiency of Soviet naval forces is their inability to detect submarines in the open ocean. While they have an extensive ASW R&D program devoted both to acoustic and non-acoustic detection sensors, the Soviets clearly lag behind the U.S. in both acoustic detection signal processing and quieting technology.

U.S. naval construction has stressed the building of aircraft carriers as well as other major combatants--cruisers, destroyers, and frigates. The Soviet fleet, however, is expected to have essentially the same number of such vessels in 1985 (see Figure II-12). Comparison of total naval force levels (not including auxiliaries or patrol vessels) indicates that the USSR fleet outnumbers the U.S. fleet by nearly three to one (see Figure II-13). But, as a result of larger, heavier ships, the U.S.

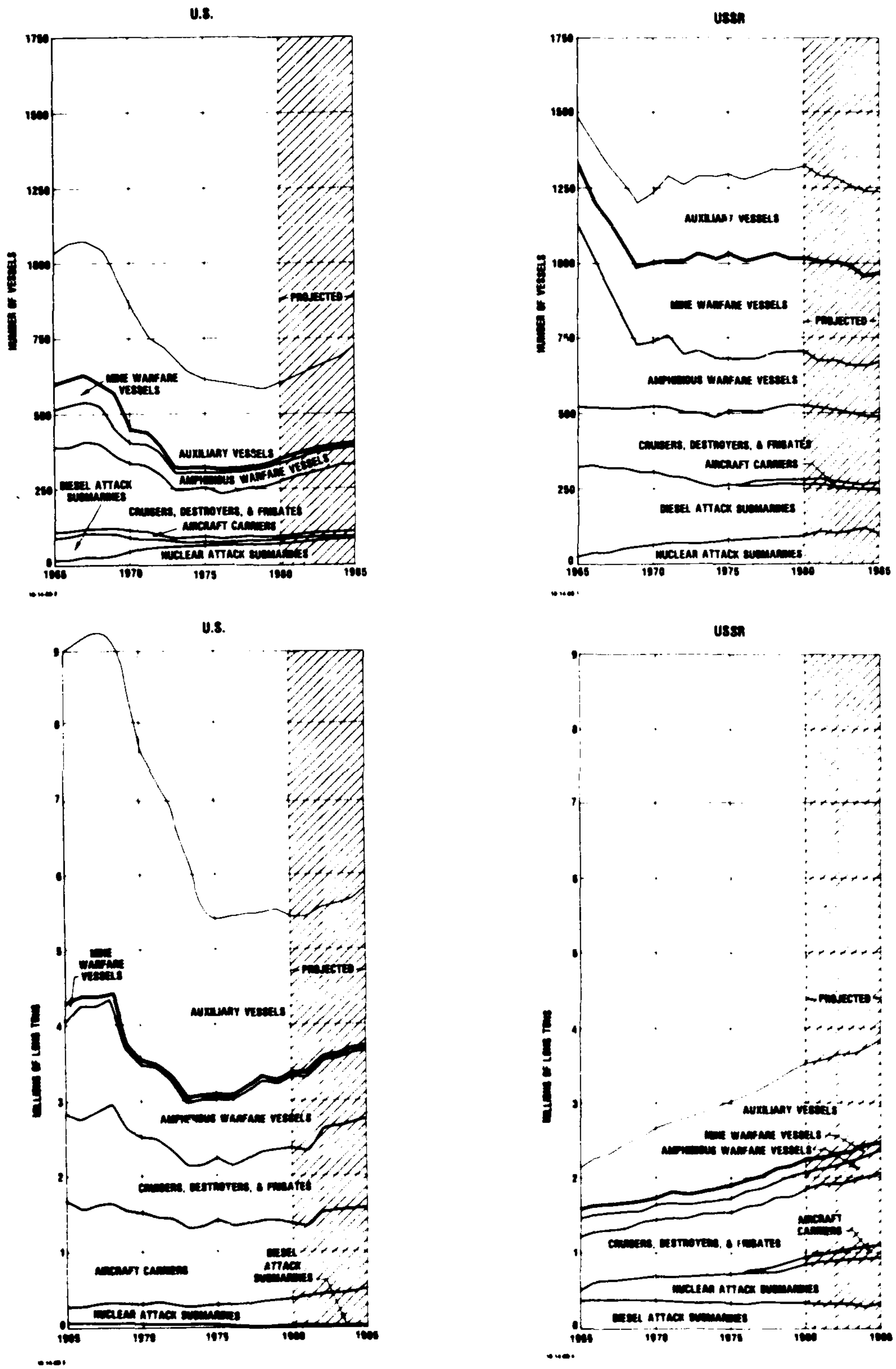

FIGURE II-13 · General Purpose Fleets: Force Levels and Tonnages fleet is 50 percent heavier than the USSR fleet. The total tonnage of new Soviet ships was 90 percent of the comparable U.S. new tonnage in the 1971-1980 period and this trend toward heavier combatants continues in new Soviet classes. These new Soviet ships and supporting auxiliaries reflect a thrust toward power projection capabilities at increasingly long ranges.

Table II-6 summarizes the annual production of key weapons solely for use by the general purpose forces of both NATO and Warsaw Pact countries. Figure II-14 illustrates the ratios of total weapons production by NATO and the Warsaw Pact for both strategic and general purpose forces. NATO produced more in only the two categories of military helicopters and

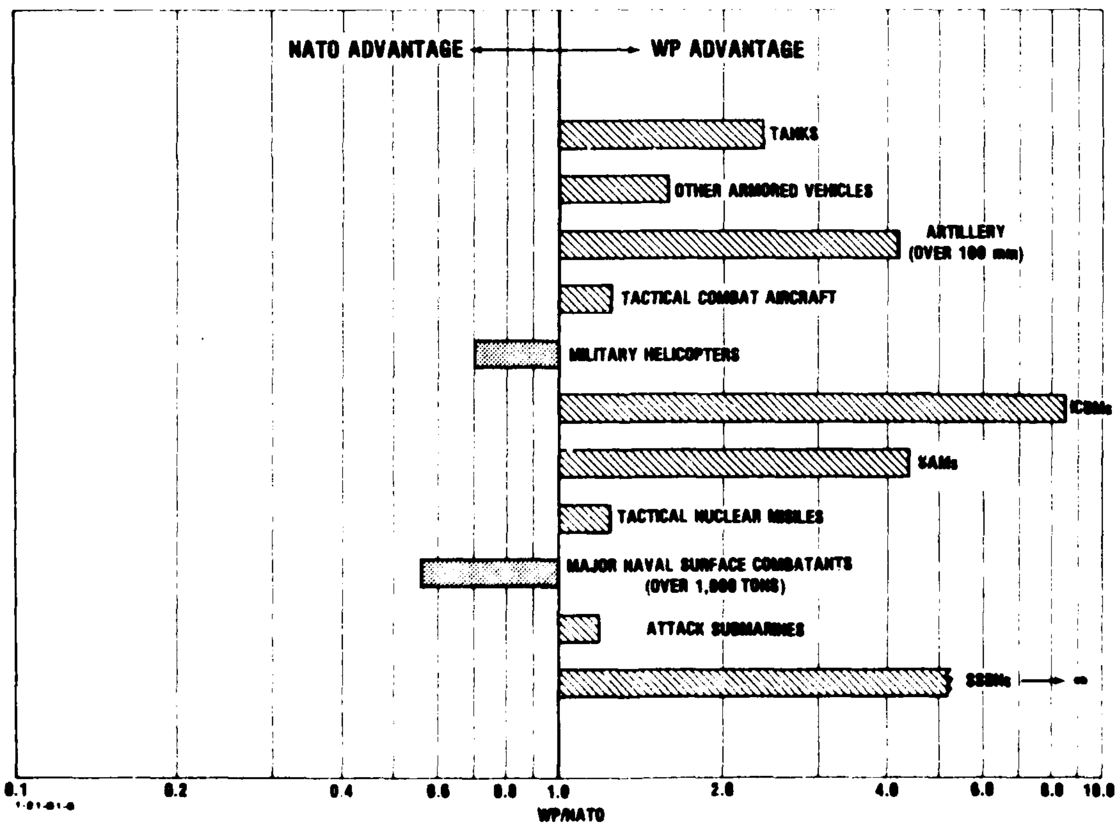

FIGURE II-14. Ratios of 1976-1980 Average Annual Production of Selected Weapons by WP and NATO Countries major surface combatants. Otherwise Pact production exceeded that of NATO, generally by a substantial margin.

E. A COMPARISON OF BASIC MILITARY TECHNOLOGIES

As I reported last year, our technology is still superior to that of the Soviets in most areas. But the sustained Soviet production of new equipment incorporating their latest technology is eroding our preeminence in deployed equipment. The Soviets have established and maintain a vast base of facilities for designing, developing, and testing military systems.

To support the Soviet Union's expanding military strength and economy, the Soviet leadership continues to attach great importance to the development of professional manpower. But, for a variety of reasons, the productivity of such Soviet scientific workers is much less than our own. The number of scientific workers engaged in U.S. military R&D is less than 300,000.

Table II-7 compares the status of the most important basic technologies. This list, like that developed last year, does not show the fragile nature of technology (e.g., the rate of technological progress over time or the military effectiveness of a particular deployed technology over time). I note that the U.S. lead in most of the technologies has been narrowed in the past few years. As Soviet R&D investments and technological competence continue to increase, they will provide growing opportunities for future technological surprise.

Table II-8 compares the technology level reflected in deployed weapon systems. Despite the imbalance in RDT&E outlays, we have maintained technological leadership in most critical areas. But our technical advantage in deployed equipment is eroding, especially in weapons for the ground forces. One of the most significant observations from this assessment is that while the Soviets lead in only two of the basic technologies in Table II-7, they

TABLE II-7 RELATIVE U.S./USSR STANDING IN THE 20 MOST IMPORTANT BASIC TECHNOLOGY AREAS

BASIC TECHNOLOGIES	U.S. SUPERIOR	U.S.-USSR EQUAL	USSR SUPERIOR
1. Aerodynamics/Fluid Dynamics		X	
2. Automated Control	X		
3. Chemical Explosives			X →
4. Computer	← X		
5. Directed Energy		X	
6. Electrooptical Sensor (including IR)	X →		
7. Guidance and Navigation	X →		
8. Hydro-acoustic	X →		
9. Microelectronic Materials and Integrated Circuit Manufacture	← X		
10. Non-Acoustic Submarine Detection		Cannot determine	
11. Nuclear Warhead		X	
12. Optics	X →		
13. Power Sources (Weapon)			X →
14. Production/Manufacturing	X		
15. Propulsion (Aerospace)	X →		
16. Radar Sensor		X	
17. Signal Processing	X		
18. Software	X		
19. Structural Materials		X	
20. Telecommunications	X		

1. The list in aggregate was selected with the objective of providing a valid base for comparing *overall* U.S. and USSR *basic* technology. The technologies were specifically not chosen to compare technology level in currently deployed military systems. The list is in alphabetical order

2. The technologies selected have the potential for significantly changing the military balance in the next 10 to 20 years. The technologies are not static; they are improving or have the potential for *significant improvements*.

3. The arrows denote that the relative technology level is *changing singificantly in the direction indicated*

4. The judgments represent averages within each basic technology area.

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TABLE II-8 RELATIVE U.S./USSR TECHNOLOGY LEVEL IN DEPLOYED MILITARY SYSTEMS*

DEPLOYED SYSTEM	U.S. SUPERIOR	U.S.-USSR EQUAL	USSR SUPERIOR
Strategic			
ICBM		X	
SSBN/SLBM	X→**		
Bomber	X→		
SAMs			X
Ballistic Missile Defense			X
Anti-satellite			X
Tactical			
Land Forces			
SAMs (including Naval)		X	
Tanks			←X
Artillery		X	
Infantry Combat Vehicles			X
Anti-tank Guided Missiles		X	
Attack Helicopters		X →	
Chemical Warfare			X
Theater Ballistic Missiles		X →	
Air Forces			
Fighter/Attack Aircraft	X→		
Air-to-Air Missiles	X		
PGM	X		
Air Lift	X		
Naval Forces			
SSNs		X	
Anti-Submarine Warfare	X →		
Sea-based Air	X →		
Surface Combatants		X	
Cruise Missile		X	
Mine Warfare			X
Amphibious Assault	X→		
C^3I			
Communications	X→		
Command and Control		X	
Electronic Countermeasure		X	
Surveillance and Reconnaissance	X→		
Early Warning	X→		

*These are comparisons of system technololgy level only, and are not necessarily a measure of effectiveness. The comparisons are not dependent on scenario, tactics, quantity, training or other operational factors. Systems farther than 1 year from IOC are not considered.

**The arrows denote that the relative technology level is changing significantly in the direction indicated.

11-18-80-19

lead in the technology level of seven of the deployed weapon systems listed. The greater number of arrows pointing toward Soviet superiority in both tables is also a matter of grave concern. These perceptions underscore the need to improve our exploitation of basic U.S. technology as we translate it into deployed military capability.

III. ACQUISITION MANAGEMENT

A great deal of emphasis has been devoted in recent years to the front end of the acquisition process. Our major policy documents have been reissued this past year with special consideration of flexibility, affordability, and both design and price competition in the acquisition process. Also, we have undertaken initiatives in international acquisition of defense requirements which we believe will have laid the groundwork for even greater expansion in the next decade. A major current concern is the capability of our industrial base to provide for both peacetime and emergency defense needs and we have initiated a number of activities which should help to stimulate productivity and the capability to expand production when needed. Other efforts have dealt with improvements in contract financing provisions and streamlining of the regulatory and specification systems. The management of the DoD acquisition process is a complex undertaking which calls for balance and an approach tailored to the specific system, considering the urgency of the need and the maturity of the underlying technology. Much has been accomplished to make the process more practical and responsive to take full advantage of the strength of our free enterprise system. However, as new challenges are identified, we must retain the flexibility to respond to them.

A. INITIATING NEW PROGRAMS

During the past year our major systems acquisition policy documents, DoDD 5000.1 and DoDI 5000.2, were updated and reissued. We emphasized flexibility to allow for the differences between such diverse acquisitions as ammunition and spacecraft while assuring adherence to the fundamental policies evolved over the last decade. Moreover, as a result of our direction that new major systems starts must be identified and described in a Mission Element Need Statement (MENS) before funding will be made available, the practice of generating the MENS and using it to obtain consensus on the need before a new program is allowed to begin is now becoming institutionalized. Two of the major benefits of the MENS process are the early identification and resolution of issues and a better alignment of our research and development efforts with our production requirements.

Challenges which still lie ahead include a better definition of an acquisition strategy which takes into consideration not only the next phase of the development process, but lays out a baseline plan for the management of the entire acquisition and includes considerations of affordability, facilities investment, and the ability to obtain effective price competition. This baseline plan should be generated to address the broad aspects of the strategy by Milestone I and be refined as the program progresses through concept validation. Courses in program management and systems acquisition management at the Defense Systems Management College (DSMC) include coverage of the entire acquisition process and provide a valuable forum for discussions of experience and new initiatives.

B. AFFORDABILITY

Since military planning must be responsive to national objectives and requirements, military plans will not ever be static. However, the pause in modernization from the mid 1960's to the mid 1970's has resulted in the initiation of more development programs than we can hope to efficiently produce. In an effort to respond to all new requirements there is a tendency to increase the size of the "bow wave." As a result, more and more programs are stretched out to the point where production rates are uneconomical and where starts and stops disrupt development as well as production.

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Affordability is a potential issue at DSARC Milestones I, II, and III, but particularly at Milestone II where a decision to enter full scale development is tantamount to a decision to enter production if the development proceeds satisfactorily and if the threat endures. We must continue to ask whether we are really serious about going ahead with a program when adequate funds for the development and production of the system in question are not contained in the programming and budgeting documents.

C. USE OF COMPETITION

The concept of competition is basic to our free enterprise system. Our procurement laws and regulations embody the principle of acquiring goods and services for the DoD by competitive means. However, care must be taken to ensure that we do not equate the acquisition of military systems with the consumer market where most goods are available "off-the-shelf." In the acquisition of military equipment, we often find ourselves in a position of having to design new equipment and to finance the construction of production facilities from the ground up.

A simplistic way of looking at competition is to look only at price competition. Yet we know that it is the competition of ideas and concepts, which we have fostered with our attention to the front end of the acquisition process, that really taps the potential of our free enterprise system and gives us the leading edge in technology. This design competition is then followed by price competition during the production phase when we have determined that the total quantity to be produced, the rate at which production can take place, and the initial investment in a competitive source make economic sense. There are circumstances where this may not be the case. Examples include the acquisition of petroleum products, where a worldwide decline in supplies resulted in an absence of competitive bids for our requirements; spacecraft where a "production run" may be two or three units; and a situation where the production rate does not support investment in two facilities, especially where the initial investment is significant. Competition under such circumstances may have to be viewed in a broader context. For instance, DoD supports DOE's efforts to provide financial assistance to contractors for the development of alternate fuel sources which will make the market competitive again and lessen our dependence on foreign supplies. The competition for a spacecraft may end in the design stage if the winning design will be built by the contractor who developed it for the total number of that type of spacecraft required. However, as long as more than one supplier is building spacecraft, a form of price competition might still take place among spacecraft programs as the various spacecraft programs compete for limited resources.

Competition is also affected by other factors. A continuing concern has been the enhancement of productivity in long term production programs. The constraints of budget and funding guidance have forced the acquisition of major weapon system production to be conducted through the use of year-to-year contracts. Economies and efficiencies that can be obtained in multiyear commitments by the government are severely inhibited by this approach. Contractors are unwilling to commit their resources for laborsaving equipment, order long lead time material, optimize production of components, or maximize labor efficiency appropriate for long term production without a commitment by the government. Year-to-year contracting does not provide for such a commitment. We have initiated action to identify long term stable production programs where savings can be achieved through multiyear acquisition. Our objective is to place several multiyear contracts in FY 1982 where budget and fiscal guidance can be mated. We anticipate greater use of multiyear acquisition in future years, where significant savings can be achieved.

D. INTERNATIONAL ACQUISITIONS

We are convinced that the 1980's portend an era of "international acquisition" for the Department of Defense. For example, we are currently revising the DAR to implement the "Agreement on Government Procurement," one of the multilateral agreements resulting from the Tokyo Round of multilateral trade negotiations within the 1979 General Agreements on Tariffs and Trade (GATT). Our efforts within NATO have resulted in 11 general reciprocal procurement MOU's which have the objective achieving arms cooperation and opening the defense markets within the Alliance to greater competition. There are now underway in the DoD a number of significant multinational programs such as Seasparrow, F-16, AIM-9L, AWACS, and we are on the threshold of several others. We are concerned about preparing our acquisition specialists for this new and growing business environment, and have undertaken a number of initiatives in this direction:

- Section VI, Foreign Purchasing, of the DAR has been completely revised to incorporate the general MOU's with NATO, as well as other arms cooperation agreements we have with Israel, Egypt, Switzerland, and Australia.
- We conducted a highly successful "Multinational Codevelopment/Coproduction Workshop" with industry and other government agencies to assimilate DoD experience to date, and chart a course for the future. We expect many of the recommendations will be incorporated into a new DoD directive on codevelopment and coproduction.

- The DSMC has expanded their basic course on international program management, and has instituted a central repository at DSMC for multinational program "lessons learned" and key program documents.

- We are developing other techniques for transferring international corporate knowledge and lessons learned among the Military Departments. For example, we have begun development of a number of international acquisition "guides" to program managers, and will shortly publish a DoD newsletter on international activities. Of particular note, we have conducted two experimental "International Acquisition Strategy" panels made up of experienced experts in our current NATO programs for the purpose of helping structure future programs--and are quite pleased with the success to date.

- We are continuing to explore ways to conserve NATO government managerial resources in this new international business environment. We are currently discussing with our allies reciprocal contract administration and pricing/auditing annexes to the general MOU's with the objective of avoiding duplication of administrative effort in those areas where it makes sense.

Finally, we have undertaken one unique program in the international area called "Defense Production Assistance" which deserves a special mention. This is a cooperative program with selected countries designed to assist nations in improving their own organic defense production capabilities. The program involves having a DoD team survey the country's defense industry, and working up an integrated plan to help the country achieve their objectives for an expanded defense production base. The specific projects are then implemented through FMS procedures. We currently have such cooperative programs with Egypt, Pakistan, and Turkey, and have recently surveyed Indonesian production facilities. The social-economic stability that this type of a "self-help" program develops in-country (employment, using plant capacity, technology development, etc.) outweighs the possible cost savings of direct acquisition of hardware in many cases, and serves as a medium to bridge the gap between pure economic assistance (Aid) and arms transfer.

E. PRODUCTIVITY AND RESPONSIVENESS OF THE INDUSTRIAL BASE

We are continuing our emphasis on developing policy and programs to improve the management, productivity and responsiveness of the defense industrial base for both peacetime and emergency needs. This has involved a broad range of initiatives keyed mainly to improving the health of an industry confronted with a scarcity of materials, aging plants and equipment, increasing leadtimes, skilled manpower shortages, all contributing to increased cost and lagging productivity. To improve this condition we are directing actions to provide a more stable business environment for defense suppliers and at the same time, reduce the cost of defense systems.

- We are providing direct assistance to the Federal Emergency Management Agency and the Department of Commerce to update the policies and regulations which implement the Priorities and Allocations (Title 1) provisions of the Defense Production Act (DPA) of 1950, as amended. This legislation requires priority performance on defense contracts and authorizes control of scarce and critical materials essential to national defense. The DPA is not only necessary for maintenance of defense program schedules during peacetime; it provides the means for direct industrial support of accelerated defense requirements during surge conditions or full scale mobilization. Recognizing the past and present demonstrated results of this vital legislation, and that we have no suitable substitute in time of need, we are developing improved policies and procedures for more effective implementation.

- We are continuing to encourage the use of Title III of the DPA. This title provides a mechanism for price support, guaranteed loans or other actions that are necessary to stimulate the growth or establishment of domestic capabilities. With the increased use of this authority we can reduce present and future shortages of materials critical to our ability to acquire defense systems economically and on schedule. Actions proposed under this authority will require OMB approval and Congressional funding.

- The Defense Science Board (DSB) this past summer addressed Industrial Responsiveness. Their study produced approximately 30 recommendations addressed to both industry and the DoD for improving productivity and capital investments. Among these were proposals for improving cash flow for defense contractors, tax policy changes, and increased manufacturing technology efforts.

- We have instituted a joint OSD and Service Committee to investigate methods for improving the productivity of our industrial base. Methods being investigated include policy actions to stimulate greater contractor investment in productivity enhancing equipment, modernization of overaged DoD-owned equipment and the introduction of greater stability into defense programs by increased use of multiyear contracting.

- It is estimated that there will be a shortfall of 250,000 skilled machinists by 1985. In cooperation with other government agencies and industry, we plan to establish a program to help correct this projected shortfall. Alleviating this manpower shortage is critical if we are to have an industrial base that is responsive to peacetime and emergency defense requirements. In the government-owned sector of the base, we will continue emphasis on reducing government ownership of plants and equipment while expanding our reliance on the privately owned sector fc defense production. We also plan to make larger investments at government-owned plants where our ownership is determined essential. These investments will be made to improve manufacturing productivity, increase responsiveness and decrease weapons systems costs.

- We are also implementing a new program to improve the management of DoD-owned industrial property. This program will provide a central visibility of all DoD-owned industrial plant equipment through greater use of mechanization instead of more expensive manual reporting. It will further reduce the amount of reporting presently required by contractors while improving DoD control and accountability of billions of dollars of government assets. We are continuing efforts to enhance our Energy Conservation and Management Programs by introducing energy saving technology and equipment in government-owned plants. We are taking measures to improve various allies' industrial production capability through the Defense Production Assistance Program. This program is intended to provide production techniques to improve a country's self-sufficiency for manufacturing or maintaining defense systems or components. We are increasing our efforts to promote development of improved manufacturing techniques, processes, material and equipment to provide for timely, reliable, and economical production of defense materiel and we are requesting greater funding support to accomplish this.

F. DEVELOPING THE FEDERAL ACQUISITION REGULATION

Under OFPP sponsorship and in cooperation with GSA, we have been drafting a Federal Acquisition Regulation (FAR) for all executive agencies. The FAR will replace the Federal Procurement Regulation (FPR) and much of the Defense Acquisition Regulation (DAR). It is also the centerpiece of the uniform procurement system that OFPP submitted to Congress in

October 1980. When both the DoD and GSA prepared drafts are revised in response to comments, OFPP plans to issue the FAR under the statutory authority of DoD, GSA, and NASA. The FAR will be maintained by an interagency council and staff.

G. CONTRACT FINANCING

High interest rates and working capital requirements have increased the importance of cash flow to defense contractors. Our current contract financing policy has resulted in significant working capital requirements when deliveries are not made until relatively late in the contract period of performance. We are planning to change our contract finance policy to reduce unwarranted contractor investment in working capital. The net result will be improved profitability, enabling industry to increase its investment in productivity enhancing plant and equipment.

H. SMALL BUSINESS, STANDARDIZATION, AND SUPPORT

1. Increased Opportunities for Small Business and Disadvantaged Business Concerns

- Small business and disadvantaged business concerns and firms in labor surplus areas are being provided increased opprotunities to contribute to the defense effort through breakout.

- We have established definitive criteria needed to set aside a procurement for exclusive participation by small firms.

- Our FY 1981 goal for prime contract awards to small business and disadvantaged business concerns is $14.7 billion while our subcontract goal is $11.2 billion. Included in these goals is an FY 1981 objective of $2.4 billion in prime and subcontract awards to business firms which are both small and disadvantaged.

2. The Defense Standardization and Specification Program (DSSP)

The key DSSP initiatives are: Standardization within NATO at the subsystem level; preparation and use of simplified product descriptions to maximize the acquisition of commercially available material; prudent application and tailoring of specifications and standards in weapon systems acquisition; adoption and use of national voluntary standards, and the control of parts proliferation in the logistics system.

- o New NATO standards on drawing practices and configuration management will simplify coproduction and maintenance of common equipment.

- o The program established by DoDD 4120.21, "Application of Specifications, Standards and Related Documents in the Acquisition Process," has been significantly expanded and tailoring in specific acquisitions is required.

- o The Department of Defense adopted approximately 600 voluntary standards in 1980--an increase of almost 29 percent since last year. Approximately 2,700 voluntary standards have been adopted for use by the DoD to date. Significant standardization progress has also been made in reliability, maintainability, quality assurance, configuration management, test methodology, and thermal joining of metals.

- o DoDI 4120.19, "Department of Defense Parts Control System," promotes the reuse of parts of proven performance to avoid proliferation and achieve life cycle cost savings. It is anticipated that during FY 1981 some 540 (220 new) defense contracts will require parts control reviews. Approximately 38,000 nonstandard part types and 8,500 drawings will be reviewed with about 12,000 part types recommended for replacement by existing standard parts.

- o An "Emergency Consumption Reduction Program," initiated in 1980 will identify specifications for energy-consuming devices and will ensure that each contains an appropriate efficiency requirement.

- o An ad hoc working group is being established to develop a comprehensive DoD-wide action plan to improve standardization and management of Electronic Test Equipment. The program will be initiated in FY 1982 and measurable results are expected by FY 1984.

3. Embedded Computer Resources (ECR)

This area of investment continues to grow not only in absolute terms but in its fraction of the total DoD budget. The most recent estimate is that ECR (hardware plus software) will form 2.9 percent of the total DoD TOA in 1980 and 9.5 percent in 1990. The total dollar estimates are \$4.1 billion in 1980 and \$38 billion in 1990, in current year dollars.

We continue to consider this a special interest area and are revising policy guidance to:

- o Reduce unnecessary proliferation of both hardware types (as described at the architectural level) and of software languages.

- o Introduce Ada, the DoD common language, to minimize the unproductive duplication of software development and support systems required both in government facilities and on the part of our contractor community.

A new software acquisition management course has been developed by DSMC to educate program managers on the importance of understanding embedded computer systems.

4. Reliability and Maintainability (R&M)

DoD directive on R&M (DoDD 5000.40) has been issued and the supporting F' Military Standards are being revised.

New policies emphasize those R&M engineering activities that actually improve the R&M of a system, as opposed to those activities that merely predict or measure R&M.

R&M affects a number of areas of a system's performance. To assure proper balance and understanding, we have stated the need to manage R&M as it relates to operational readiness, mission success, maintenance manning, and logistics support cost.

5. Acquisition and Distribution of Commercial Products (ADCoP)

- o Policies and procedures have been issued requiring defense product descriptions to be written in the simplest form, reflecting acceptable, commercially available products, processes, practices and technologies.

- o A formal training course has been developed to educate DoD personnel on ADCoP policies and to translate the policies for system, subsystem, equipment (including support equipment) and other product applications.

- o A DoD manual is in final development to provide guidance and direction regarding ADCoP.

6. Cost Containment/Reduction

One of the critical problems facing us is the rapid growth of weapon systems acquisition and ownership costs. In the report of its 1979 summer study, the DSB concluded that the unit cost of defense equipment is growing at a rate that makes it virtually impossible to maintain current force levels. Design to cost can help slow unnecessary cost growth. Our efforts are being directed toward integrating these cost containment activities, developing more consistent application, and focusing on future cost objectives and status during our DSARC and other program reviews.

7. Quality Program

We are emphasizing the need for independent quality assessments on major systems as stated in DoDD 4155.1 and DoDI 5000.2. There is a need to emphasize quality of design and the quality assurance of products and services throughout industry.

8. Support and Manpower Considerations

- As a major step in implementing the new acquisition policies, MRA&L, is leading a joint OSD/Service project to revise the Logistic Support Analysis (LSA) Guidelines (Mil Std (1388). The revision will expand the scope of the LSA guidelines to include specific Milestone 0, 1, and II analysis procedures and will include substantially greater emphasis on early tradeoffs which affect manpower and training.

- OUSDRE and OASD(MRA&L) are jointly sponsoring an initiative to formulate a weapon support R&D program. This will build on current logistic R&D efforts and will include lead weapon demonstration projects, technology efforts, and establishment of centers of excellence in weapon support technology areas. Because of the importance and high leverage, I am allocating $15 million for these efforts in FY 1982.

- The DSARC has continued to increase attention on R&M and weapon support problems. As a result, the Patriot and Copperhead decisions were for low rate production until substantial improvements were demonstrated in R&M. Additionally, the TTC-39 (Tri-Tac) switch decision was to conduct additional tests to demonstrate maintenance and training approaches prior to production deliveries.

Finally, OUSDRE and OASD(MRA&L) are jointly sponsoring the development of new guidelines for test and evaluation of the operational suitability of weapons in the DSARC process. These have the objective of achieving more consistent test planning and evaluation methodology with regard to how support features are tested and how the data are analyzed.

IV. INTERNATIONAL INITIATIVES

A. INTRODUCTION

Our major goals in this area are establishment of more effective armaments cooperation with NATO and other allies, strengthening technology transfer policies and improving export control practices. The heightened tensions produced by the Soviet invasion of Afghanistan have highlighted the need for a strong commitment to achieve these goals.

While NATO continues to be the focus of our international initiatives, we are also working closely with many other allies including Japan, Australia, Korea, Israel and Egypt. During the past year, we have begun discussions with The Peoples Republic of China. In order for these efforts to continue as currently planned, we need the continued support of the Congress.

B. PROGRESS TOWARDS ARMS COOPERATION

Table IV-1 provides a comprehensive summary of programs and activities underway. The following are some of the highlights of the year's activities.

1. <u>NATO-Related Programs</u>

The triad of initiatives launched two years ago is beginning to bear fruit.

a. <u>MOU's</u>. General Reciprocal Purchasing Memoranda of Understanding (MOU's) intended to facilitate industrial cooperation among the defense industries of participating nations have been signed with 11 countries: the UK, Canada, France, Germany, Norway, The Netherlands, Italy, Portugal, Belgium, Denmark and Turkey. We expect that Greece will execute an MOU in the near future which will complete this phase of the

General MOU initiatives.

One very practical step we have taken to put life into these general acquisition MOU's is to conduct a series of industrial seminars with government and industry representatives of signatory countries to stress arms cooperation and to brief them on US acquisition policies and procedures. One such seminar was held in January 1980 in Washington, D.C. It included government and industry representatives from the US, Belgium, Denmark, the Netherlands, Norway and Portugal. Two others were held in Germany in March and May for the benefit of German industry. These industrial seminars were well received and served to convince our allies that DOD is quite serious about opening the defense markets within NATO to greater competition. We are encouraged by the fact that our allies have reciprocated in kind and hosted two similar conferences for the benefit of US industry. US delegations of government and industry representatives visited Norway in May and Belgium in October for briefings on European acquisition policies and opportunities for US industry participation in European defense programs. In a very successful event, the German Ministry of Defense (MOD) came to Washington and briefed over 400 US industry and government representatives on the Federal Republic of Germany acquisition process. US representatives will continue to participate in similar industrial seminars with other NATO allies in the coming year.

In addition to the general MOU's, we have negotiated and signed a number of programmatic MOU's with individual NATO nations for the cooperative development and/or production of specific systems. Among those recently signed are: an MOU with France and Germany for a cooperative program to develop military identification techniques for use in the 1980's; with France to assure interoperability of tactical information distribution systems (the French SINTAC with the US JTIDS); with the UK to develop common test procedures for munitions and explosives; and, MOU's with Germany for test of STINGER POST, to develop ECCM techniques for VHF combat net radios and to cooperate within the area of Army tactical data systems.

We expect to sign a number of other MOU's during the first months of 1981. Among them are: an MOU with France, Germany, and the UK to develop a terminally guided warhead for the Multiple Launch Rocket System; and, with France, Denmark, Italy, The Netherlands and the UK to perform a concept study leading to a feasibility demonstration of advanced radar techniques.

b. Dual Production. Under this concept, once a nation has completed development of a system, it can license the system for production by other allied nations. This method reduces duplicative R&D, fosters standardization and increases alliance combat effectiveness.

Figure IV-1 is a list of US-developed weapons systems that we have offered to the Independent European Program Group (IEPG) for dual production in Europe. Of these, the AIM-9L is being dual-produced by a European consortium (GE, UK, Norway and Italy). MODFLIR, a night vision device, is the subject of an MOU with Germany. The Germans expect to begin production of MODFLIR as a component of several of their weapons systems in 1981. An IEPG panel has approved STINGER--a man-portable air defense system--as a co-production candidate. Negotiations are currently in progress with Germany to consummate this arrangement. An MOU was concluded with The Netherlands establishing it as lead nation in a NATO European consortium which will produce the M483A1, 155mm Improved Conventional Munition. Germany, Italy and the UK have already joined with The Netherlands in this endeavor, and it is hoped that other NATO nations will follow. The US will produce the French/German ROLAND air defense system, the Belgian MAG 58 armor machine gun and the German 120mm smooth-bore tank gun.

c. Family of Weapons. Significant progress has also been made in the third of our NATO initiatives, the Family of Weapons. Under this concept, we deal with operational requirements that can only be satisfied by a family of related weapons. Here, too, the purpose is to enhance alliance combat effectiveness and improve the efficiency with which the alliance uses its limited R&D resources.

When the mission needs of either the US and/or Canada and at least one of the member states of the IEPG coincide, both in time and in required capability, the US and/or Canada would develop one of the required systems in a family, while one European country, or a consortium of IEPG members, would develop the complementary system.

In this past year we have concluded agreements with our allies for the anti-tank guided weapon (ATGW) and air-to-air missile families.

In the ATGW family, the European nations are responsible for the development of a long-range, vehicle mounted system, while the US is responsible for a medium-range, man-portable system. In the air-to-air family, the European nations are responsible for the next generation of advanced short-range air-to-air missile (ASRAAM) while the U.S. is responsible for development of the advanced medium-range air-to-air missile

(AMRAAM). Details about these and other programs which are receiving increased NATO emphasis are given in Chapter VII, Tactical Programs, and Chapter VIII, Defense-Wide C^3I.

In addition to the steps being taken under this triad of initiatives, we continue to pursue other efforts to develop a feasible approach to long-range weapons planning for NATO. The NATO Armaments Planning Review (NAPR) has just become a regular part of NATO procedures. A planning process which would focus on harmonization at the earliest possible stage--the definition of requirements--is currently undergoing a series of trials under Conference of National Armaments Directors (CNAD) auspices. NATO member nations are currently reviewing nine mission need statements on a trial basis as part of the proposed Periodic Armaments Planning System (PAPS). In addition, NATO member nations have recently approved implementation of PAPS Milestone 1. This provides that any NATO member nation, or any major NATO command, can introduce a mission need document (MND) into the PAPS system. The MND is then circulated among other NATO member nations to establish the degree of interest. Interested countries are then invited to cooperate in the preparation of an Outline NATO Staff Target (ONST).

These long-range efforts should lead to the institutionalization of weapons harmonization throughout NATO.

One of the most far-reaching activities undertaken at the behest of the NATO defense ministers (based on the recommendations of a Long-Term Defense Plan Task Force Report) was the work of the Air Defense Planning Group (ADPG). The ADPG addressed a comprehensive program that includes all air command and control (both defensive and offensive), NATO airborne Early Warning, NATO IFF, Multi-Functional Information Distribution Systems (MIDS) and air defense weapons. The result will be a long-term (15 year) blueprint for improvement in the total NATO air defense capability. The U.S. has formed a shadow group (European Theater Air Command and Control Study--ETACCS) to follow all of the air command and control activities identified by the ADPG.

Collectively, these efforts contribute directly to enhanced standardization and interoperability within the alliance. This is a critical objective, since even small standardization/interoperability gains may translate into substantial improvements in forecast alliance combat effectiveness on the European battlefield.

2. Non-NATO Initiatives

Our non-NATO cooperative activities have expanded just as our interests in both the Middle East and Far East have continued to grow over the past few years.

Our current cooperative activities with Israel are based upon a Memorandum of Agreement signed between our governments in 1979. This agreement facilitates activities in research, development and in procurement. Our R&D activities include test and evaluation of each other's equipment, funding of R&D in the other country, competitive R&D, and joint projects. The procurement activities are similar to those of the NATO reciprocal MOU's except that the principle of removing obstacles is not applied as broadly, but is limited to some 500 items.

Our cooperation with Egypt, also based upon a Memorandum of Understanding is focused on programs to give their defense industries the new capabilities to support their force needs, initially in spares and consumables but eventually with major equipments. This involves provision of data packages, technical assistance, specialized study and design efforts, and procurement of components, all within the military sales program. The program with Egypt is quite similar to the program with our NATO ally Turkey.

Japan, Australia and New Zealand are considered for sales of military equipment in the same manner as the nations of the North Atlantic Alliance. We believe standardization and interoperability with these nations to be important as well.

Our cooperative activities with Australia and New Zealand concentrate on technical data exchanges and the conduct of selected projects of joint sponsorship. Japan purchases U.S. equipment, but gives emphasis to the in-country production of U.S.-designed equipment. Japan also undertakes significant development work. Our cooperative activities are now those of technical data exchange and arrangements for in-country production. We hope to broaden the data exchange with their government and industry in order to plan ahead together, and thereby to share more of the benefits from our prospective technical and industrial strengths.

We cooperate with the Republic of Korea in a program to develop their defense industrial base in support of the needs of their Armed Forces. The program is similar to the programs with Egypt and Turkey, except that it has been under way for almost a decade, with significant successes.

The newcomer to our cooperative activities in the Far East is the Peoples Republic of China. Clearly, our cooperative activities with the PRC are different (and will continue to be different for some time to come) from the cooperative programs undertaken with our NATO and other allies. Our first visits and exchanges with the PRC have been warm and have generated the expectation of a long-term mutually beneficial basis for cooperation. Consequently, our policy is now to consider exports of selected military equipments and technology to the PRC, but not weapons. PRC procurement items which are approved will be on a commercial basis and not through military sales. But evidence that the end-user is engaged in military activities will no longer necessarily result in a sales denial by the Commerce Department on dual-use items.

In contacts with the Association of Southeast Asian Nations (Indonesia, Malaysia, Philippines, Thailand and Singapore), we have found that significant improvements in indigenous production capabilities can be achieved by the infusion of modest amounts of U.S. technology. How fast and how far we can go with this type of cooperative initiative will require further study.

C. TECHNOLOGY TRANSFER

Our efforts during the past year have focused on the processing of munitions and export cases referred to DOD by the Departments of State and Commerce. Other activities involved implementation of the Export Administration Act of 1979 and Post-Afghanistan initiatives relating to restricting high technology trade with the USSR. These actions included the development of a Military Critical Technologies List (MCTL), improvement of DOD responsiveness to defense and commercial industry license applications, the preparation and negotiation of Coordinating Committee (COCOM) initiatives, and the development of military and dual-use technology transfer guidelines for the Peoples Republic of China (PRC).

On 1 October 1980, a summary of the major areas of the MCTL was published in the Federal Register. The list contains detailed descriptions of the technologies which are strategically critical. During the coming year, DOD will review the comments received from industry and other agencies on the MCTL. These comments will be incorporated into a revised list which will ultimately become a part of the Department of Commerce Commodity Control List.

Resolutions passed by both the House and Senate during the 96th Congress require the DOD to review and revise the present U.S. Munitions List. The purpose of this review is to delete equipment, goods and technologies which are more accurately described as civil or dual-use commodities than arms or munitions and therefore more appropriately controlled by the Export Administration Act and Regulations than by the International Traffic in Arms Regulations.

The required review of the U.S. Munitions List must reflect the politico-military experience of the past, as well as the current state of the art in military technology. Therefore, the review must reflect past experience and still integrate the results and recommendations of the military critical technologies list development activity which was mandated by the Export Administration Act of 1979. While levied on the State and Defense Departments, the required review will of necessity involve the Commerce Department as well.

Preliminary review of the U.S. Munitions List is now underway. The State and Defense Departments are in the process of developing a joint statement of work to achieve the stated objectives. The review is planned for completion during FY 1981 and will recommend additions, deletions or modifications to the List where appropriate.

In coordination with the other agencies, a number of DOD proposals were submitted to COCOM for increased coverage of items such as integrated circuit manufacturing equipment, jet engines and the additional control over polysilicone. We are trying to better define the restrictions on the export of sensitive computer technology and related equipment. New proposals were also submitted to review manufacturing and production technology sales for major facilities and a "no exceptions" policy for the USSR whenever exception cases are received.

The Agencies also agreed to a spare parts policy which assesses the risk associated with the sale of spare parts and servicing of equipment previously sold to the USSR. Within DOD, we are now reviewing all license applications for the USSR under much tighter guidelines than were in effect prior to the invasion of Afghanistan.

As part of the improved cooperation between the U.S. and the Peoples Republic of China, an extensive effort has been underway to develop specific guidelines for military and dual-use technology transfer to the PRC. This effort has included an analysis of the present and potential capability of the PRC to absorb U.S. technology and the specific technologies which could be transferred with low risk to U.S. national security.

Additional areas which required extensive effort in the technology trade area were participation in the Foreign Disclosure and Technical Information Systems (FORDTIS) Steering Committee and Congressional hearings. The FORDTIS project is a long term ADP program to combine export case data, munitions cases, MCTL, foreign military sales and intelligence data into one data system.

D. FOREIGN WEAPONS EVALUATION (FWE)

We will continue the FWE program using the $9.7 million requested in the FY 1982 budget. The program is executed through review and prioritization of foreign weapons and technologies which the Services propose for technical/operational test and evaluation. The prime criterion used to prioritize the proposed candidates is the degree to which a given system has the potential to provide DOD with capabilities to satisfy real operational needs, fill voids in current inventory, or contribute a component or technology for which there is no similar U.S. alternative. Use of these funds includes lease or purchase of systems to be evaluated, modification of the systems (or directly related equipment) to be tested, technical and operational test support, test data reduction, engineering studies and refurbishing costs related to returning test or test support systems to original configuration.

On-going FWE programs are listed in Table IV-2 by sponsoring Service. Notable capabilities emerging from this program are:

1. The UK Combat Support Boat which is now being procured by the U.S. Army.

2. The continuing work on the UK Giant VIPER minefield clearing system.

3. The Norwegian Light Anti-Armor Weapon (LAW), procurement of which is under active consideration.

FIGURE IV-1

U.S. DUAL PRODUCTION CANDIDATES

ARMY

MODFLIR	-- NIGHT VISION EQUIPMENT
PATRIOT	-- AIR DEFENSE SYSTEM
STINGER	-- MAN-PORTABLE AIR DEFENSE MISSILE
HELLFIRE	-- HELICOPTER-BORNE ANTI-TANK MISSILE
IFV	-- INFANTRY FIGHTING VEHICLE
SOTAS	-- STAND-OFF TARGET ACQUISITION SYSTEM
VIPER	-- LIGHT, SHORT-RANGE, UNGUIDED ANTI-TANK ROCKET
M-735	-- 105MM ARMOR PIERCING FIN STABILIZED DISCARDING SABOT TANK GUN AMMUNITION
COPPERHEAD	-- 155MM CANNON LAUNCHED LASER-GUIDED MUNITION
M483A1	-- 155MM ARTILLERY IMPROVED CONVENTIONAL MUNITION (ICM)
RAAM	-- 155MM REMOTE ANTI-ARMOR MINE
ADAM	-- 155MM ARTILLERY DELIVERED ANTI-PERSONNEL MINE
AAH	-- ADVANCED ATTACK HELICOPTER
BLACKHAWK	-- UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM

NAVY

AIM-9L	-- AIR-TO-AIR MISSILE
HARM	-- HIGH-SPEED ANTI-RADIATION MISSILE

AIR FORCE

JTIDS	-- JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM

TABLE IV-1

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
ARMY				
ATGW	All NATO Nations	Infantry Man-Portable Anti-Armor Assault Weapons Systems (IMAAWS) Program. A medium-range man-portable anti-tank weapon, which in combination with the European long-range vehicle mounted system will comprise a NATO family of third generation Anti-Tank Guided Weapons (ATGW).	• NATO RSI of advanced anti-armor systems. • FR/GE/UK/US MOU signed on 17 Mar 80 for the exchange of information leading to a third generation ATGW family.	• US role in the third generation ATGW is to develop the medium-range man-portable system. The Europeans will develop the long-range vehicular mounted system. • MOU to exchange information on improvements to existing second generation anti-tank weapon systems is expected to be signed in second quarter FY81. System improvements will keep systems such as TOW viable until the ATGW family is fielded.
BRIDGE ERECTION BOAT	UK	The UKCSB features a shallow draft, (22 inches compared to 41 inches for the current US Standard 27 foot bridge erection boat that it will eventually replace.) It is 27 feet long, has a top speed of 25mph, and is *unsinkable*. It can be carried and launched by the RIBBON BRIDGE transporter fitted with a cradle. Delivery to US Army units will begin in December 1981.	• S/I of Bridge Erection Combat Support Boat (CSB). • Potential S/I with other NATO Nations. • Contract for 120 UKCSBs was awarded on 23 Sep 80.	• The UKCSB was adopted as the US Army Standard in Aug 80. • Other NATO Nations have expressed an interest in the UKCSB.
BRIDGING FOR THE 80's	GERMANY UK	Family of bridges designed to achieve maximum interchangeability of components for all required bridge roles, i.e. assault, dry gap support, and wet gap support. In assault role, bridge is transported on launchers adapted to chassis of national main battle tank. In other roles on a special wheeled vehicle launcher.	• NATO S/I of advanced technology bridging. • Nations share development costs. • International competition by industry for production of equipment.	• Technical Feasibility testing of national prototypes completed. • International Final Concept Team identified two different concepts that could meet requirements. • Studies underway to develop areas of compromise to permit international program to proceed. • Senior level meeting in Apr 81 to determine degree of collaboration possible.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
ARMY (Continued)				
COPPERHEAD	GERMANY ITALY UK	US-developed 155mm cannon launched projectile. Provides artillery with capability to engage *stationary and* moving armored targets with indirect fire.	• NATO S/I of 155mm artillery projectiles. • MOU with UK signed Jun 78 (FMS, or *co-production at UKs option*). • PGM Systems, Inc., (A GE/US Industry Consortium) munitions export licence application submitted.	• PGM Systems, Inc. is continuing to explore co-production possibilities. • Initial production decision *approved in* Nov 79. • Interoperability with European GCT and SP-70 systems has been established.
M483	GERMANY ITALY NETHERLANDS UK	155mm artillery submunition projectile compatible with standard howitzers and propelling charges. Provides a significantly increased lethality over the standard high-explosive projectile through use of submunitions.	• NATO S/I of artillery ammunition. • Conforms to a 155mm GE/IT/UK/US MOU regarding ballistic parameters.	• MOU granting the Netherlands *the lead* in a NATO consortium to produce the M483 signed Oct 80.
M.A.N TRUCK	GERMANY	Diesel powered, 8x8 drive, 10 ton truck. Developed and produced by Germany. Will serve as a prime mover and recovery vehicle for Army PERSHING II and Air Force GLCM.	• Interoperability with GE.	• In-use with GE forces. • US production contract for 15 vehicles signed 31 Oct 80, with option for an *additional* 450.
MLRS	FRANCE GERMANY UK	Multiple Launch Rocket System (MLRS) designed to deliver large volume of ordnance in a short period of time against critical, time sensitive, area-type targets.	• NATO S/I. • FR/GE/UK/US MOU signed on 14 Jul 79 for cooperative development program. • Military Equipment Characteristics Document (MECD) for a Terminally Guided Warhead (TGW) was signed by FR/GE/UK/US on 15 May 80. • Procurement plan approved on 27 Jun 80. • Letter of Intent to jointly develop a TGW signed on 23 Jul 80.	• US is funding development cost of basic system ($350M). • *GE is funding development of* scatterable mine warhead ($50M). • FR & UK have each contributed $5M in FY80 for basic system development. Like amounts are expected in FYs 81 & 82. • MOU *Supplements for procurement and* TGW development are being negotiated. • Request For Proposal for TGW due for release in Mar 81.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
ARMY (Continued)				
MOD FLIR	GERMANY NETHERLANDS	Family of forward looking IR common modules (MOD FLIR) developed by US for use in target acquisition and fire control systems, e.g., TOW Night Sight (AN/TAS-4) and Tank Thermal Sight (AN/VSG-2), and AH-1S Telescopic Sight Unit (M65).	• MOU with GE signed Apr 78 (FMS and Co-Production). • MOU Supplement agreement with GE signed May 79 (Production Technical Data Package for modules and parts). • Same modules used in Navy and AF airborne FLIRs. • Possible employment by many allies.	• AN/TAS-4 and AN/VSG-2 were fielded in Europe in 1979. • 2 competing MOD FLIR tank sight designs fabricated by US/GE contractors and delivered to GE for test. (TI/ZEISS design was selected as thermal sight for Leopard, Marder and Luchs vehicles). • Pilot production of GE made common modules scheduled to begin 1981. • MOU with GE/NE expected to be signed in Jan 81.
PATRIOT	BELGIUM DENMARK FRANCE GERMANY GREECE NETHERLANDS	Surface-to-air, medium and high-altitude, air defense system designed to counter the field Army air defense threat in the 1980s and 1990s.	• NATO S/I of air defense systems. • MOU signed, Oct 78, by NE/BE/DN/GR/US to determine preferred European option to acquire PATRIOT. • MOU signed by FR and by GE 10 Jan 79.	• MOU nations have established multi-national PATRIOT Program Steering Comm and full-time management group. • Group recommendations regarding PATRIOT are expected in Apr 81.
RIBBON BRIDGE	GERMANY NETHERLANDS	RIBBON BRIDGE—Individual bridge bays are transported and launched by a special 5-ton truck. Sections are joined together in water to make bridge or rafts. Bridge and raft can sustain class 60 loads in currents up to 8 FPS, and class 70 loads in currents up to 5 FPS. Incorporates most recent technology.	• NATO S/I of Floating Bridge. • Establish an International Configuration Control Board to assure that equipment manufactured in one country will be interoperable with other Armies equipment.	• US design drawings provided GE which then produced RIBBON BRIDGE for US Army. • GE & US equipment has been intermixed in a bridge demonstration. • US actively pursuing establishment of a Joint Configuration Control Board. • GE granted authorization to produce RIBBON BRIDGE for sale to NATO members, Sweden & Switzerland.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
ARMY (Continued)				
US ROLAND	FRANCE GERMANY NORWAY	All-weather, highly mobile short-range air defense system, developed by FR/GE and will be produced by FR/GE/US. Intended to protect critical targets in corps rear areas.	• FR/GE/US established Joint ROLAND Control Comm to ensure max standardization. • Over 560 field-replaceable sub assemblies are interchangeable with the European version.	• Entered production in Europe in 1977. • US production initiated Oct 79. • Norway plans purchase of US fire control unit. • FR/GE/US joint improvement program MOU expected in early 1981.
STINGER	BELGIUM GERMANY GREECE ITALY NETHERLANDS NORWAY TURKEY	Advanced man-portable air defense system (MANPADS), which is the follow-on to the REDEYE system. It uses a passive IR homing guidance system which operates independently after initial arming and launching by the operator. Target engagement will be possible in all aspects.	• NATO S/I of short-range air defense (SHORAD) systems. • Approved for US production in 1977. • IEPG reported in Oct 79 that STINGER dual production would be pursued in an IEPG panel. • IEPG briefed by GE in Oct 80 on latest co-production efforts. Increased interest shown by members.	• Expected to be fielded by US in 1981. • GE has chosen STINGER and is formulating an acquisition strategy. • IT/NE/BE/TK/GR/NR have expressed interest in STINGER sales or co-production.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
NAVY				
AIM-9L	GERMANY ITALY NORWAY UK	IR air-to-air missile to be employed on numerous NATO aircraft, including the F-16 & MRCA. A third generation missile which incorporates an all-aspect attack capability.	• NATO RSI of air-to-air missiles. • MOU, signed in Oct 77, with GE to lead European consortium to co-produce the AIM-9L missile in Europe. UK, Italy & Norway are participating. GE now arranging for manufacture of specific parts by each country.	• GE has signed letter of offer for 1500 AIM-9L missiles. • The AOTD (fuze) for the missiles produced by the consortium will be purchased by GE from the US at first. The AOTD may eventually be produced by the consortium in support of follow-on AIM-9L production.
ERMISS	FRANCE GERMANY NETHERLANDS UK	US Navy participating in NATO project to develop Explosive Resistant Multi-Influence Sweep System (ERMISS).	• MOU signed in 78 with GE, FR, UK & NE, which covers the initial 2-3 years of the ERMISS development.	• NATO steering comm overseeing ERMISS work chaired by US for first year. • Current R&D effort includes studies of mine explosion phenomena, ship propulsion, structural mechanics, seakeeping, structural concept development materials application & shiploads.
HARPOON	DENMARK GERMANY GREECE NETHERLANDS TURKEY UK	Anti-Surface ship missile which could be launched from ship, submarine, aircraft, or shore.	• NATO RSI of anti-surface ship systems. • Currently in use by NE, DK, TU, GE & UK.	• UK has purchased sub-HARPOON a variant of the US Navy's HARPOON Missile.
IRST	CANADA	Shipboard IR Search & Track System (IRST). Joint US/Canada three-phased program, under MOU, signed in 1976. Phase I—demonstration of feasibility to form basis for providing operational capability. Phase II—T&E. Phase III—procurement.	• NATO RSI of electro-optical devices. • NATO Information Exchange Group 1-SG/5 on Electro-Optical Devices expected to propose establishing NATO project. • Possibility that other NATO nations will participate in IRST development & procurement phases.	• Participants in NATO IEG/1-SG/5 being kept abreast of US/Canada program. • OT 11B sea trials successfully completed aboard USS KINCAID in Nov 79. • Navy FY 80 analysis indicates AAW capable ships could be significantly upgraded by IRST at relatively low cost. • AD successfully completed. • IRST ED start up in FY 81.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
NAVY (Continued)				
NATO SEA GNAT	DENMARK GERMANY NORWAY UK	Ship-launched Chaff IR decoy system to protect against air & sea launched anti-ship missiles.	• Goal—provide NATO with standardized chaff/IR decoy system with resultant economics in development costs as well as potential savings in procurement & logistics costs. • Coop R&D effort, sponsored by NATO Naval Armaments Group, under MOU signed in 1976. • NATO SEA GNAT project established in 1977 by consortium of NATO nations.	• As a result of NATO studies, common requirements for ship-launched decoy system to protect against air & sea-launched anti-ship missiles. • NATO consortium for NATO SEA GNAT now in coop program to develop decoy rounds to protect ships against radar, IR, & hybrid radar/IR guided missiles.
NATO SEA SPARROW	BELGIUM DENMARK GERMANY ITALY NETHERLANDS NORWAY	Point defense missile system, which includes fire control radar, launcher & a variation of the SPARROW missile intended to provide point defense to various classes of ships.	• NATO RSI of navel point defense systems. • MOU signed in 1977 by US, GE, IT, BE, DK & NE to form consortium to produce NATO SEASPARROW. • As of Nov 1980, 37 US & 25 NATO consortium ships have NATO SEASPARROW.	• Installation in all consortium ships expected to be coplete by FY 85. • US now developing SEASPARROW RIM-7M (Monopulse) missile as a system improvement. It will be made available to other members of consortium. • SEASPARROW is administered by a NATO project steering committee.
P-3 ORION	CANADA NETHERLANDS NORWAY	Maritime patrol aircraft with mission of surveillance, location & attack operations against submarines & surface ships.	• NATO RSI of anti-submarine systems. • Study results indicate that P-3 is one of NATO's most effective & economical anti-submarine systems.	• P3B currently in use by Norway. • Canada contracted to procure modified P-3C version (CP-140). • Netherlands has agreed to purchase 13 P-3Cs.
PENGUIN II	GREECE NORWAY	Norwegian PENGUIN MK 2 system provides combatant craft & patrol boats with means to launch surface-to-surface anti-shipping missiles.	• NATO RSI of anti-surface ship systems. • US Navy negotiated MOU with Royal Norwegian Navy (RNON) for test & evaluation of suitability of PENGUIN MK 2 for USN. • PENGUIN MK 1 was developed in 1962-70 by RNON, with limited US Navy participation.	• MOU signed Apr 79 for US test & evaluation of PENGUIN. • Missile & system have been employed by RNON since 1972. • MK 2 system is now in production for the RNON & other European countries. • US OPEVAL scheduled for 1st Quarter FY 81.
ROLLING AIRFRAME MISSILE (RAM)	DENMARK GERMANY	Formerly the Anti-Ship Missile Defense System (ASMD), the RAM missile is a fire & forget system that will meet the naval requirements for point defense in a high threat environment thru the mid-1990s. It will provide increased firepower to supplement other point defense systems.	• NATO naval missile, standardization. (Limit launching system to 2 variations.) • MOU was signed in Apr 79 with GE & Denmark for joint full-scale ED (FSED) following 2 years of AD by US — GE. • Other consortium nations have expressed interest in the concept of providing a RAM capability to their SEASPARROW launchers.	• MOU for FSED program was signed in Apr 79 upon completion of DSARC II. • Anticipated delivery date is FY 86. • Funding for R&D is fully programmed thru FY 85. • Belgium, the Netherlands, Norway & Canada have observer status in the program. • An IR all-the-way seeker is being tested by the US.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
AIR FORCE				
AMRAAM	All NATO Nations	Advanced medium Range Air-to-Air Missile (AMRAAM) is an all weather, all aspect, radar missile capable of engaging numerically superior aircraft forces before they close to visual range. It will have compatibility for multiple launches at beyond visual ranges and become autonomous soon after launch to permit the launch aircraft to maneuver and/or engage more targets quickly. It is being developed as a follow-on to the SPARROW AIM-7F/M missile.	• AMRAAM NATO RSI plan has been developed. • AMRAAM will be compatible with F-14, F-15, F-16 and F-18 aircraft, as well as applicable air defense and air superiority NATO interceptor aircraft of the late 1980's. • AMRAAM will satisfy NATO staff target for MRAAM. • Staff target was written by NAFAG SG 13 and is approved by all participating nations (with the exception of France).	• At the Apr 78 CNAD meeting, USDRE proposed, as part of the air-to-air package, that primary developer of next beyond visual range (BVR) air-to-air missile be the US which has already begun its AMRAAM program. • NATO-based foreign contractors are expected to participate as part of a European consortium and establish agreements with US contractors to be eligible as second sources in the production phase. • Four Power Air-to-Air Family of Weapons MOU signed in Aug 80 by GE, FR, UK, and US. • US to develop next medium range missile (AMRAAM); UK & GE to develop next short range missile. FR is in a special observer status and has not committed to full participation. • Exchange of aircraft/missile interface data requirements with GE and UK is in progress. • AMRAAM is currently in a competitive validation phase with deliveries of the production item expected in mid 1980's. • AMRAAM is fully funded for the validation phase leading to Milestone II in early FY82.
AWACS	BELGIUM CANADA DENMARK GERMANY GREECE ITALY LUXEMBOURG NETHERLANDS NORWAY PORTUGAL TURKEY UK	E-3A airborne Warning and Control Systems (AWACS) combines sophisticated radar with advanced data processing and common systems in a modified Boeing 707 aircraft to provide mobile, survivable, jam-resistant, wide area all altitude air surveillance command & control.	• NATO RSI of Airborne Early Warning (AEW) systems. • In 1975, NATO judged AWACS superior to other AEW candidates. • In 1977, UK began development of their own AEW aircraft (NIMROD). • MOU was approved at Dec 78 DPC. Congress approved US participation and funds for US share of program in 1979. • Development contract definitized Apr 80. • Production contract definitized Sep 80.	• Total current program is for 18 US NATO standard configured AWACS, mod of approx 43 ground sites, refurbishment of main operating base and other facilities. • UK current program is for complementary 11 NIMROD acft and UK has agreed to make them interoperable with E-3A an NATO ground environment. • Production of AWACS, under NATO auspices, began in 1979, with first aircraft delivery to NATO in Feb 82.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
AIR FORCE (Continued)				
F-16	BELGIUM DENMARK NETHERLANDS NORWAY	F-16 Multinational Fighter Aircraft Program is a joint development production effort between the US and European Participating Governments (EPG's)	• NATO RSI of Fighter Aircraft • MOU between US and EPG's was signed in June 75 • Letters of Offer and Acceptance totalling over $2.8B signed in May 77 for purchase of 348 EPG F-16 aircraft and associated support.	• Standardization between USAF and EPG F-16's is being coordinated thru the F-16 Multinational Configuration Control Board. Benefits of S/I will be achieved thru basing large number of USAF F-16's in Europe, as well as thru common logistics support base with EPG's. • Multinational operational T&E of the F-16 is being jointly conducted by US and EPG aircrews in both US and Europe. Joint tests will enhance interoperability by establishing common training baseline, common tactics and employment concepts.
HARASSMENT DRONE (LOCUST)	GERMANY	US GE developed LOCUST vehicle is an expendable vehicle designed to harass the enemy's threat radars by delivering a warhead to damage the equipment. It is a one way vehicle, thereby eliminating post-launch recovery and refurbishing problems.	• NATO RSI of Harassment Drones EW systems. • NATO Long Term Defense program (LTDP) as the #3 priority program for improving the air EW capability of NATO in the 1980's.	• LOCUST will be equipped with payload to allow capsule to acquire, guide to and dive on a target. • Congress has approved FY 80 funding ($4.7M). • US/GE MOU for full scale development signed Mar 80. • Full scale US/GE codevelopment now underway.
JP-233	UK	UK developed airfield attack system consisting of area denial & catering subunitions for low level high speed deliveries.	• Standardize upon single interoperable munition for airfield attack.	• US/UK initiated Full Scale Development (FSD) in 1977. • FSD phase to be completed mid-1984. • Congress did not approve FY 81 funding for continued US participation.
KC-135 REENGINING	FRANCE	The KC-135 French C-135F will be reengined with the CFM56. The CFM56 is jointly produced by General Electric (USA) and Snecma (France)	• Mutual Developmental cost sharing • Weapon system interoperability • International cooperative development	• USAF has approval for first acft development. MOU with FR MOD at DOD for approval. Estimated FR signature Jan 81. This MOU will include FR sharing non-recurring costs of the first acft in order to reengine 11 C-135Fs at a later date.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
AIR FORCE (Continued)				
MAVERICK	BELGIUM DENMARK GERMANY GREECE ITALY NETHERLANDS PORTUGAL TURKEY	US developed, self-guided, rocket-propelled air-to-surface missile design to destroy small, hard tactical targets. Missile has a family of terminal guidance seekers (TV, IR and laser)	• Encouraged NATO to adopt family of Maverick missiles. • US has released TV guided version (AGM 65 A/B) for FMS sales.	• BE/DK/GE/IT/NE/PO are considering FMS buys of the TV guided version. • AGM 65A/B in Turkey and Greece inventories. • GE & IT are both interested in leading a European Consortium to co-produce the imaging Infra-Red (IIR) version of MAVERICK.
NAVSTAR GPS	BELGIUM CANADA DENMARK FRANCE GERMANY ITALY NETHERLANDS NORWAY UK	NAVSTAR Global Positioning (GPS) is a satellite-based, universal positioning and navigation system. It was designed by the US to provide precise position information and time for accurate world-wide weapons delivery and reduce proliferation of navigation aids.	• Provide continuous world-wide, all-weather positioning system for NATO use. • MOU signed in Apr 78, with nine Allies for NATO participation in NAVSTAR GPS. MOU created a NATO team located at the NAVSTAR Joint Program Office (JPO), LA AFS, Calif. • CNAD created the NATO GPS Project under control of a Steering Committee.	• 12 Allied personnel, including the NATO Deputy PM, are now in the NAVSTAR JPO and are integrated into the user equip. program management, and operational applications functional areas of the NAVSTAR JPO. • Entered FSED in Aug 79. • Equipment standards in initial draft stage in Aug 80. • Ionospheric tests in Norway completed *in Sep 80.* • European/Canadian demonstration completed in Oct 80.
RAPIER	UK	Rapier, a short range air defense missile system, will be used for the point defense of USAF bases in the UK.	• NATO RSI of air defense. • UK will provide manning for US purchased Rapier systems.	• UK Secretary of State for Defence and SECDEF agreed in principle for US purchase and UK manning of system on 24 Jun 80.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
AMMO COMMONALITY				
20-40mm	FRANCE GERMANY UK	Standardized families of ammo between 20-40mm calibers.	• Goal—that within 15-20 years NATO nations will have no calibers between 20-40mm which are not interoperable. • FR/GE/UK/US Ad Hoc Group of tech members is working toward agreement on standard families of ammo between 20-40mm calibers.	• Agreement in principle upon which 20-40mm ammo families will be standardized. • MOU signing expected in Spring 1981.
120mm (Tank Gun)	GERMANY	US/UK/GE program conducted for standardization of tank main armament systems.	• Tank Gun ammo S/I within NATO. • GE 120mm smoothbore gun selected for XM1 following tests of US 105mm, UK 120mm rifled bore, and GE 120mm, all firing improved ammo. • Configuration management working groups established for max S/I for NATO use	• Terms of ballistic parameters have been provided to NATO through Panel IV of the NAAG. • US negotiated a license agreement with GE for US production of GE's 120mm gun system. • US will unilaterally develop advanced technology 120mm kinetic energy ammunition.
155mm Ammo	GERMANY ITALY UK	155mm weapons and ammo standardization with participating NATO nations.	• 155mm ammo S/I within NATO. • MOU with GE/IT/UK signed in 1969, revised in 1978. Revision requires participating nations to develop only 155mm ammo that meets criteria in MOU and that ammo and howitzer development conform to ballistic parameters in MOU.	• Testing to confirm interchangeability of newly developed ammo began in 1980. • Copies of MOU and required drawings have been provided in response to FR request for consideration in development of new howitzer.
NATO Small Arms Ammo	BELGIUM CANADA DENMARK FRANCE GERMANY GREECE LUXEMBOURG NETHERLANDS NORWAY UK	NATO program for standardized interoperable small arms ammo within NATO	• NATO S/I of small arms ammo. • MOU between 11 NATO nations for T&E and selection of second NATO standard small arms ammo, and if possible, a standard NATO infantry weapon. • NATO standard 7.62mm ammo will continue as NATO standard round, for primary use in medium machine guns.	• International Test Control Comm (TCC) responsible to Coordinating Panel (*representatives of each participating* nation) conducted the technical and operational testing. • A one year operational test was conducted at Hammelburg, GE, using approx. 200 troops from 6 nations. • Final test report and recommendation approved by CNAD 22 Oct 80 • Work on STANAG on-going.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
COMMUNICATIONS & IDENTIFICATION				
Air Defense Program.	All NATO Nations	A comprehensive program for improving all aspects of air defense and air operations has been approved by the NATO Defense Ministers	• To integrate offensive air operations with defensive operations. • To make all air C2 interoperable and survivable.	• A new NATO Comm is being established to direct the program. • A systems engineering team to design the C2 portions of the program is being established. • A military requirements statement is being completed.
Combat Net Radio	All NATO Nations	US has proposed under auspices of the TSGCEE NATO nations study, define and agree to NATO ECCM technical interoperability standards for VHF tactical single channel combat net radios (CNR) for post 1985 time frame.	• NATO interoperability of all combat net radio equipment. • US offered NATO nations participation in US funded SINCGARS V ECCM development and testing to provide them with threat, R&D and test data produced as well as ensuring NATO interoperability. • NATO Ministers agreed that all new combat net radio equipment introduced after 1985 would be designed to common specs, or common standards.	• US Army will continue program to develop SINCGARS-V to replace Army & Marine Corps tactical radios, and be interoperable with NATO combat net radios. • Discussions being held with GE regarding T&E of GE & US developed ECCM module for CNR. Additionally, several NATO nations have signed an MOU with the US to participate in evaluation of SINCGARS V. Result may be selection of one for NATO interoperability.
Identification (IFF) Systems	All NATO Nations	A capability for positive and reliable identification of friends or foes (IFF) is a need common to all weapon systems especially those engaging targets beyond visual range. US participating in NATO wide architecture and development of NATO Identification System (NIS) that will overcome shortcomings of current IFF	• Achieve NATO IFF interoperability. • STANAG for signal architecture of NATO is being drafted by Tri-service Group for Communication and Electronic Equipment (TSGCEE) Project Group 2, to allow nations to proceed with development programs.	• GE has conducted demonstration of experimental IFF system. • GE UK US MOU signed May 80 providing for cooperation on NIS development.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
COMM & IFF (continued)				
JTIDS	FRANCE GERMANY UK	Joint Tactical Information Distribution System (JTIDS), in joint development by US, will provide means of interconnecting and facilitating real time, jam resistant, secure exchange of combat critical communications between tactical force elements.	• Goal—provide jam resistant communications systems interoperability within NATO. • As NATO nations adopt JTIDS, or introduce JTIDS compatible equipments, significant improvements in interoperability between tactical elements and NATO Forces will be achieved. • JTIDS' potential as integrated comm nav id (CNI) system under study for NATO as a Multifunctional Information Distribution System (MIDS).	• Formal selection of JTIDS as jam resistant commo link for NATO airborne early warning aircraft (AWACS) Dec 78. Production for US & NATO AWACS programs began Jul 80. • UK plans JTIDS for NIMROD AEW, air-defense TORNADO aircraft, and elements of UK Air Defense ground environment. • GE acceptance of JTIDS as standard system dependent upon frequency clearance in Europe. • Compatibility tests underway in FR, GE & the UK.
SATCOM	All NATO Nations	Satellite Communications (SATCOM) sharing between US UK & NATO SATCOM assets to enhance NATO interoperability	• Goal—completely interoperable NATO Satellite Commo systems and ground terminals. • US & UK have made use of NATO satellites IIIA in the Atlantic area and NATO IIIB in East Pacific. • US has made limited use of UK SKYNET satellite to provide communications for special users.	• Effort now on-going to ensure next-generation of US & NATO SATCOM systems be completely interoperable. This will provide for contingency operations, as well as being the most economical for the US & NATO nations to achieve the required capability.

Table IV-2

Army

Combat Support Boat -- UK
22 Caliber Rimfire Tracer Cartridge (Tank Gunnery Training) -- Germany
5.56mm Practice Ammunition -- Germany
.50 Caliber Practice Ammunition -- Germany
4.2 Inch Mortar Subcaliber Training System -- Germany
Smoke Pots -- Canada, Japan and UK
NBC Battlefield Marking Set -- Germany
Hand Grenade Fuze -- Germany
9mm Handgun -- Italy
Personal Dosimetry System -- Germany
Lightweight Decontamination System -- Norway

Navy

76mm VT-RF Fuze -- France, Italy and the Netherlands
Shipboard Integrated Processing and Distribution System (SHINPADS) -- Canada
Low-Cost Targets -- France, Italy and UK
.50 Caliber NM 140 High Explosive Incindiary Ammunition -- Norway
Vertical Launch SEA SPARROW -- Canada and the Netherlands
84mm Carl Gustaf Recoilless Rifle -- Sweden
PAP-104 Mine Neutralization System -- France
Osborne Acoustic Mine Sweeping System -- UK

Air Force

BAP-100 Airfield Attack System -- France
Munition Handling Equipment -- Israel
Raufoss 20mm Air-to-Air Ammunition -- Norway
Raufoss Manufacturing Technology Evaluation (Multi-Caliber) -- Norway
Durandal Airfield Attack System, Joint Program with the Navy -- France

V. THE SCIENCE AND TECHNOLOGY PROGRAM

A. INTRODUCTION

The Science and Technology (S&T) program is made up of the Technology Base, Advanced Technology Developments and the Manufacturing Technology Program.

- o The Technology Base consists of Research (6.1) and Exploratory Development (6.2) efforts,
- o The Advanced Technology Developments (ATDs) comprise about 23 percent of the Advanced Development (6.3) category, and
- o Manufacturing Technology is funded primarily from the procurement appropriation, Industrial Preparedness (7.8).

B. OBJECTIVES

The primary objective of the S&T program is to maintain a level of supremacy which enables the United States to develop, acquire and employ new military capabilities required for national security. Our strategy is to use national S&T capabilities as an offset to the disparity between Soviet Union and United States investment in military equipment over the past decade To match the Soviets gun for gun, tank for tank, or missile for missile, we would have to roughly double our investment in weapons. Then, as those weapons were deployed, we would have to double the size of our peacetime Army to man them. Instead, our goal is to offset the Soviet advantage in numbers by applying technology to equip our forces (and those of our Allies) with weapons that out perform their Soviet counterparts. Fundamental to this strategy is the fact that the United States leads the Soviets by five to ten years in many of the basic technologies (e.g., microelectronics, computers, jet engines) which are critical to our advanced weapons. To achieve and maintain U.S. technological supremacy we have structured our S&T program around three principal mechanisms:

- o Real growth in the S&T Program,
- o Enhancement and exploitation of our advantages in commercial technology and our industrial base, and
- o Improved cooperation with our Allies.

For FY 1982, some of our goals are:

1. <u>Increased funding for the Technology Base</u>

The most essential function of the Technology Base is to provide the technological infrastructure which is so important to the steady, evolutionary growth of our military capability. To achieve this we depend on all three of the major contributors: the DoD in-house laboratories, the universities, and the industrial contractors. During the FY 1965-1975 period the Technology Base funding declined in real terms by approximately 50 percent. This steady erosion was detrimental to long term DoD Technology needs and we established a policy of reversing this adverse trend. The real growth achieved in the S&T Program for the last few years has been used to increase the level of participation by the universities and industry.

2. <u>Increased transition of technology to military systems</u>

Technology developed can only affect our military posture when it is actually applied in a fielded military system. The DoD uses Advanced Technology Developments (ATDs) (6.3A) to demonstrate useful technology and to shorten the time required to apply the technology to military systems.

We are increasing our attention to this area to ensure that the ATDs act as bridges to speed application of technologies.

3. Expedite a selected set of technologies which are of prime importance

The Technology Base is made up of hundreds of projects covering a spectrum of technologies of interest to DoD. Many of these necessary projects provide technological progress on an evolutionary basis. However, within the Technology Base are projects which we have selected for increased management and fiscal emphasis because of their potential for greatly improved future military capabilities. They are:

- Precision guided munitions (PGMs) with adverse weather capabilities,
- Very high speed integrated circuits,
- Directed energy,
- Rapid solidification technology for superior materials,
- Manufacturing technology,
- Embedded computer software technology, and
- Chemical warfare.

C. THE FY 1982 REQUEST

The FY 1982 request provides for approximately nine percent real growth in the S&T program. This is consistent with my plan to increase the program to provide a strong base for the creation of future technical options for solving critical defense problems. Details are outlined in Table V-1.

Table V-1
Science and Technology Program
(Dollars in Millions)

	FY 1981 (FY 81 $)	FY 1981 (FY 82 $)	FY 1982 (FY 82 $)
Research			
Services	515	559	619
Defense Agencies	99	108	97
Total Research	614	667	716
Exploratory Development			
Services	1,289	1,401	1,448
Defense Agencies	651	708	786
Total Exploratory Development	1,940	2,109	2,234
Advanced Technology Developments	603	656	790
Total S&T Program (RDT&E)	3,157	3,432	3,740
Manufacturing Technology (Non-RDT&E)	155	169	216

D. MANAGEMENT OF THE S&T PROGRAM

1. In-House Laboratories

The DoD Laboratory Management Task Force which was established in 1979 has undertaken a series of initiatives to improve the efficiency and effectiveness of the DoD in-house laboratories. These initiatives lie in the areas of personnel and manpower; facilities and equipment; procurement and acquisition; and assessment and accountability. An OSD management office has been established to provide continuity and emphasis to the important goals established by the task force and to coordinate the Laboratory Management Steering Group which is the permanent body over the task force.

Of great concern is the acquisition and retention of the high caliber scientists and engineers necessary to provide leadership and technical know-how in planning and executing S&T programs. As a first step, we are establishing a DoD-wide incentive and awards program to recognize outstanding accomplishments. Also, we are emphasizing our apprentice program for high school students to encourage defense science and engineering careers. In the summer of 1980, approximately 300 students participated in this program, and we plan to increase the number of participants in 1981.

Among other initiatives are the exploration of means to accelerate the contract cycle, to improve the equipment and facilities, and to reduce the paperwork associated with R&D management. A systematic and continuing approach to resolving these difficult problems will provide significant future benefits in S&T program management.

2. Research

Management initiatives to strengthen our ties with the academic community and to enhance the quality of our Research Program are being pursued and expanded upon.

- Seven research topical reviews have been held which provide a forum for leading scientists of government, industry and academia to review and discuss DoD programs. An immediate benefit has been a 15 percent increase in the number of research proposals.

- The number of multi-disciplinary "cluster" programs have been increased to over 500. In addition, emphasis is being placed on interaction between DoD sponsored university programs and similar programs in industrial and in-house laboratories.

- A less complex university research contract has been successfully tested. Preliminary results indicate that the contracting cycle is shortened by as much as a third.

- Increased emphasis is being given to improving the quality of research equipment and instrumentation used by the university community on DoD programs. For example, the multi-university Joint Services Electronics Program was provided an additional $3 million for this purpose.

- A DoD graduate research fellowship program is being established to encourage top U.S. undergraduates to pursue graduate study and research in areas critical to the DoD mission.

3. Independent Research and Development (IR&D)

The Defense IR&D program continues to be a major contributor to our technological strength by bringing to bear on defense problems the best of industry's competition-driven creativity. Management initiatives are being implemented to encourage industry with defense related IR&D to involve the academic sector, through subcontracting of basic research, in order to improve the interaction of fundamental science with technology applications for defense needs. This cooperative approach between universities and industry promises to improve innovation for both the defense and private sectors.

4. Defense Small Business Advanced Technology Program (DESAT)

The DESAT Program is being established to increase the participation of small, high technology companies in DoD R&D programs. It is a unique attempt to link the innovative capacity of small business with important defense technical requirements. Significant contributions to the solution of national security problems are expected by offering limited short term contracts to capable small business firms for feasibility research, to be followed by longer term development contracts where appropriate.

5. Cooperation with Allies

The major portion of our S&T cooperation with Allies is carried out under The Technical Cooperation Program (TTCP) and the NATO Defense Research Group (DRG). Both of these programs provide for systematic and continuing S&T information exchanges and collaborative programs between participating nations. In addition to yielding direct benefits from cooperative R&D, these programs serve to identify and define areas which are suitable for more comprehensive and appropriate Memoranda of Understanding.

6. The Energy RDT&E Program

DoD must continue to maintain the operational readiness of our forces in the face of threats to the energy supplies required for our mobility platforms and equipment. Objectives of the DoD energy program are to:

- o Support the Department of Energy in developing a domestic synthetic fuels industry under the authority of the Energy Security Act Amendment to the Defense Production Act,
- o Improve DoD's ability to respond to rapidly changing fuel supplies by developing rapid and improved fuel specification methods and tests,
- o Assure that DoD engines can utilize synthetic fuels without degraded performance,
- o Promote energy conservation through the development of more efficient propulsion and power generating equipment and through the use of renewable and locally available energy sources, and
- o Closely coordinate activities with the Department of Energy but focus on the military requirements unique to the Department of Defense.

E. PROGRAM DESCRIPTION

1. Research

The Research program is fundamental in its approaches and is channeled into areas which are of critical importance to our future defense posture. Examples include:

- o The free electron laser (FEL) has the potential for efficiently producing high-power, coherent radiation from the millimeter wavelength to the x-ray region of the spectrum. Future research will investigate the FEL as a high energy laser and for "seeing" through regions of presently obscured visibility.
- o Ultra-small electronics research is pushing the electronic frontier toward an era of devices on the order of molecular

size. The time and space domain is so small and electric fields so large that new concepts and theories in physics will have to be developed.

- o Progress in highly parallel computer arrays has resulted in special methods of dividing large computational loads among a large number of simple computing modes. Many previously intractable problems are now solvable.

- o Research in artificial intelligence is directed at developing computers capable of mimicking man's capacity for reasoning and manual dexterity. The work is closely tied to robotics, industrial automation, and expert machine advisory services for maintenance personnel. This fundamental effort pushes the state-of-the-art in computer reasoning, knowledge representation, and manipulation.

- o Chemical, biological and radiological investigations are addressing fundamental factors whose understanding is vital to survivability in these adverse environments. Particular emphasis is given to early detection and means to control or prevent neurological damage caused by chemical agents.

2. Very High Speed Integrated Circuits (VHSIC)

VHSIC is a major technology program whose objective is to provide dramatic improvement in our capability to satisfy high speed, high throughput signal and data processing needs of military systems for the mid-1980's and beyond. The program seeks to accelerate significantly the development of advanced technology for integrated circuits (IC's) and to provide for the insertion of VHSIC products into high priority military systems.

The Military Departments have identified nineteen systems as candidates for VHSIC technology. Initial contractors will use these systems to guide systems architecture and chip design. Examples of processors being considered for system applications are:

- o Sonar acoustic signal processor for improved target detection and location,

- o Various imaging system processors including a multimode fire and forget missile signal processor and an autonomous cruise missile guidance processor,

- A synthetic aperture radar processor, and
- Spectral analysis processors for communication and electronic warfare applications.

Following an intensive planning cycle, the VHSIC program was contractually initiated in early FY 1980 with the award of nine contracts to define system architecture, chip architecture and design, integrated circuit processing, and testing. In addition, over 50 awards were made for supporting technology. The program is a fully coordinated effort, executed through the Military Departments with overall management and direction from OUSDRE. It is being carried out principally through industrial and university contracts.

Follow on awards are expected in the Spring of 1981 to develop integrated circuits with over 100:1 improvement in speed, size, and reliability.

3. Directed Energy

We are continuing development of technology for both high energy laser and particle beam weapon systems. In the latter part of this decade we may see HEL weapon systems operational for air defense and other ground combat use on the Army forward battlefield. Other potential mission applications, such as bomber defense and antiship missile defense, may be achieved in the next decade. Particle beam technology is much less mature. We are presently working on experiments to demonstrate basic feasibility of weapon systems.

Recent accomplishments and near term objectives of the directed energy program include:

- The Airborne Laser Laboratory is under going final subsystem and system checkout. In-flight firing of the laser at instrumented targets and engagement of air-to-air missiles is expected in the near future.

- Fabrication and subsystem checkout of the laser, beam pointing telescope, and other equipment for the Navy's Sea Lite demonstration program continues.

- The Army continues to make progress in the development of technology for laser systems. Army program emphasis is on laser systems for the forward battle area.

- The DARPA HEL program continues to focus on space defense, and is explained later in this chapter.

- The Experimental Test Accelerator has demonstrated close to design goal performance for a high current electron beam. The Advanced Test Accelerator with higher particle energy is scheduled for completion in FY 1982.

- The Air Force's Radial Line Accelerator (RADLAC) program will complete fabrication of RADLAC II in FY 1982.

4. Materials Technology

Tri-Service/DARPA development of metal matrix composite (MMC) materials is proceeding on schedule toward application of these materials for a range of uses including laser optical system structures, lightweight gun mounts, submarine propellers and radar antennae. Trade-off studies indicate that extensive use of MMCs as structural components of a typical supersonic cruise missile could yield a weight reduction of one-third. Substitution of MMC materials for critical or long lead time materials such as chromium, cobalt, titanium, and beryllium also appears possible. For example, it has been determined that high modulus graphite fiber-reinforced magnesium alloy composites exhibit stiffness, strength and dimensional stability properties equal or superior to those of beryllium.

It appears increasingly likely that the use of MMC materials some day will rival that of fiber reinforced plastic composite materials.

In FY 1982, we plan to move vigorously into the new area of rapid solidification technology (RST) materials. This new technology can make possible very high quality, novel families of aluminum and titanium alloys as well as previously unobtainable high temperature superalloys for gas turbine engines. Results from our modest investments thus far justify a substantial long term commitment by the DoD. Industrial studies indicate that RST technology can lead to dramatic aircraft performance improvements. For example:

- Nickel was alloyed with aluminum, molybdenum, and tungsten to obtain a 200°F improvement in heat resistance over current jet engine superalloys. This makes possible an engine of higher performance and greater fuel efficiency than any of today's turbomachines.

- Aluminum was alloyed with lithium to obtain a 30 percent increase in specific modulus of elasticity and a 100-fold improvement in life under cyclic stress conditions over present aluminum materials. The result could be a reduction of 30 percent in weight of future airframes.

- Iron was alloyed with aluminum, titanium and boron to obtain a 20 percent weight reduction and a 200°F improvement in heat resistance over current ferritic stainless steels. The advantage gained is a chromium-free stainless steel for use in critical jet engine components.

5. Manufacturing Technology

The Manufacturing Technology Program has been an effective means of reducing systems and equipment cost by increasing industrial productivity. The program exploits promising generic fabrication procedures applicable to defense products. Recent accomplishments include:

- An automated detonator loading process that increased output by 300 percent thereby eliminating the need for an additional $37 million facility.

- A computer aided ultrasonic turbine engine disk inspection system that reduced unit inspection time by 50 percent and permitted the use of near net shape forging techniques.
- An automated process for loading and assembly of center core propellants eliminated 61 persons per production line.

In FY 1982 the program will address a number of productivity enhancement tasks. Goals include reducing gun tube cost, conserving critical materials, reducing sonobuoy manufacturing cost and salvaging costly "scrap" fuel additives in propellants. In addition we plan to increase emphasis on programs related to overhaul and maintenance activities and to initiate a major thrust to improve shipbuilding and overhaul productivity.

6. Chemical Defense Technology

The recognized threat to U.S. and Allied forces and the perceived deficiencies in the chemical defense posture have produced an urgent reevaluation of the adequacy of the S&T programs. A 1980 Defense Science Board Summer Study provided a focus on areas of potential benefit, and the recommendations are now being implemented. In addition, symposia to attract both industry and academic interest have been held to develop research support and stimulate new concepts and ideas. Cooperative international programs are being strengthened to utilize all available expertise.

Research and development efforts are being increased and directed to develop new or improved equipment. Remote detection and personal dosimeters are being developed to provide early, rapid, and more sensitive alarms and warning devices. Medical antidotes, prophylaxis, and casualty care will be improved to enhance treatment of chemical casualties. Innovative approaches to new materials for the next generation of individual protective clothing, as well as improved personal mask materials, are being pursued. Decontamination fluids and dispensing equipment to allow improved mobility by more rapid and thorough decontamination of equipment, personnel and areas are under active investigation. Collective protection for armored vehicles and rapid, cheap modifications to structures to provide rest and relief facilities are proceeding well. Safe simulant materials to allow realistic training and to quantify performance degradation are under active study, with several interim simulants already approved. Programs in the development of safe binary munitions are being increased to provide tactical capabilities to the retaliatory stockpile. Binary munitions will provide significant safety advantages in the manufacture, storage, transportation and disposal of chemical munitions.

7. <u>Adverse Weather Capable Precision Guided Munitions (PGM)</u>

PGM technology efforts will continue emphasis on the development of an autonomous adverse weather capability to counter numerically superior armor, reduce launch platform vulnerability and improve the probability of killing engaged targets. A strapdown ring laser gyro (RLG) inertial guidance system has demonstrated accurate midcourse guidance for tactical missiles. 's coming year the RLG will compete with other low cost inertial guidance systems to determine if lower costs can be obtained without sacrificing midcourse accuracy.

A concentrated effort on target signature characterization for millimeter wave seekers is now moving forward. A joint cooperative program has just been completed with Germany in which infrared and millimeter wave measurements were made on armor and other high value targets such as bridges, POL sites, dams, etc. During the coming year these data will be reduced and analyzed in a search for target-unique characteristics which will allow acquisition when signal processing algorithms are employed.

Capitalizing on recent technical advances in solid state electronics technology, the Services have joined in an effort to demonstrate cost effective adverse weather seekers against land and sea targets. Both synthetic aperture radar and millimeter wave seekers will be evaluated beginning with a captive flight test demonstration in FY 1981 and FY 1982 and culminating in a free flight demonstration in FY 1983.

8. Energy Programs

The Energy RDT&E Program is concerned with demonstrating the use of synthetic fuels developed under Department of Energy (DoE) programs, testing broader specification fuels, evolving modern fuel test specifications, and improving equipment designs for more efficient use of fuels in DoD systems.

DoD has worked with DoE in preparing a solicitation to build a domestic synfuels industrial base. DoD is participating in the evaluation process for recommending awards under this solicitation, as required by the Energy Security Act and an Executive Order on synthetic fuels. The result of this stimulation will be the evolution of a synthetic fuels industry capable of supplying DoD with a major fraction of its future hydrocarbon fuel from domestic synthetic sources.

The Army energy R&D program has resulted in a continuous combustion gas turbine engine, multifuel diesel engines, and operation of the adiabatic engine. The Air Force has demonstrated shale derived fuels in T-56, J-79, J-85, and F101 combustors. New instrumentation in these tests has provided diagnostic tools to determine design changes necessary to burn hydrogen-deficient fuels. Tests have been successfully performed on many engines using specially broadened specification fuels. The Navy has investigated various factors designed to increase the energy utilization efficiency of its equipment. These include hulls and hull appendage redesigns, modified propulsion designs, and computer-assisted control of heating, ventilation, and air conditioning systems.

9. Medical Technology

This S&T effort emphasizes systems biotechnology (medical aspects of systems development), infectious diseases, and combat casualty care. Human tolerance increasingly limits technological advances in systems and doctrine. Research in this area provides needed biomedical design criteria. A major threat to contingency operations is exotic infectious disease, the second area of emphasis. Maintenance of DoD's unique Technology Base effort in drug and vaccine development will be of major importance in the next decade as erosion continues of civil sector capability in areas of DoD concern. The third area, combat casualty care, addresses technology for saving life on the battlefield and providing needed medical support to combat units.

In the past, these important medical research efforts have suffered from the appearance of fragmentation and ostensible duplication of effort. Recent management efforts have been directed at insuring the military relevance of these programs, and we are currently conducting a study of the potential benefit to be gained from some degree of consolidation of our various medical research activities. The study report is due to be completed in early 1981.

10. Aeronautical Technology

The S&T Program is embarking on a major thrust to integrate electronics and the airframe in order to achieve a significant improvement in the combat capability of tactical aircraft. It will soon be possible to "fly-by-wire" with smaller control surfaces on more highly maneuverable aircraft; to maximize aircraft performance by automatically changing the shape of key aircraft components in flight such as wing sweep, airfoil camber, and engine inlets; to provide independent six-degree-of-freedom control to increase agility and minimize weapon delivery errors; and to integrate the flight, fire control and navigation systems. These advancements will provide task-tailored handling qualities. Fire control information will be used to assist automatically or semiautomatically the pilot in maneuvering the aircraft into the proper launch envelope for a specific weapon. Additionally, these new control concepts provide the capability to conduct a maneuvering approach to launch for air-to-ground weapons, thereby increasing survivability against ground defenses. Recent simulator studies have shown that applicaton of these concepts results in a 2-to-1 increase in weapon delivery accuracy for both air-to-air and air-to-surface weapons, and up to to a 10-to-1 increase in survivability during air-to-surface weapon delivery, depending on the ground defenses.

Major advances in V/STOL technology were accomplished in FY 1980, with the demonstration of the XV-15 tilt rotor aircraft to the design limit speed of 300 knots. These tests, performed under joint sponsorship of the Army, Navy, and NASA, have demonstrated the feasibility and practicality of this concept. Testing of the tilt rotor concept, which possesses helicopter-like hover characteristics and the ability to fly efficiently at speeds up to 400 knots, will continue through FY 1982.

11. Aeronautical Propulsion

The objective of the aircraft propulsion program is to have proven technology ready for the next prototype or engineering development program. The S&T Program demonstrates propulsion advancements which can be applied to future systems.

Recent investigations of the aircraft engine development programs have recommended that additional efforts be placed on durability and reliability aspects during the early research and development phases of the program. The Congress has recognized this need and has provided additional funds for more hardware and testing of advanced components and advanced technology demonstrator engines. In addition, the technology program is being reoriented to stress reliability and maintainability.

The increasing costs of propulsion systems and the supporting costs after they are placed in operation have become a major concern. A major cost driver is the number of parts in a propulsion system. Recent efforts are aimed at reducing the number of compressor stages by improving component performance. Supporting costs can be reduced by increasing the life of engine components. A major effort in the Advanced Turbine Engine Gas Generator (ATEGG) Program is to increase the structural testing of promising new turbine engine concepts. Successful completion of these tests should provide a base for better transition of advanced technologies to engines on a timely basis.

A tri-Service working group has been formed to define an overall plan to develop and demonstrate small engine technology in the 1 to 7 pound per second airflow class. These engines are applicable to auxiliary power units, light helicopters, light fixed wing aircraft and cruise missiles, all of which are widely used by our forces.

12. Electronic Warfare (EW)

The EW technology program includes the following functional areas: detection and location, jamming and deception, counter-countermeasures, signal reduction and obscuration, and simulation. Due to the potential utility of jamming and deception technology, roughly half of the EW technology investment is concentrated in this area. Counter-countermeasures is also experiencing real growth in response to the magnitude and sophistication of the projected threat. In addition, the increased use and effectiveness of electro-optical (EO) weapon systems has resulted in emphasis on EO countermeasures.

The EW technology program includes improved receivers utilizing high speed signal processing to operate in a very dense signal environment, software programmable jammers with threat sorting capability, expendable decoys, countermeasures against monopulse radars and missile seekers, and smoke and obscurants effective against infrared and laser receivers. In addition to specific equipments, the program provides for new basic components. These include broadband high power microwave and millimeter wave amplifiers, visible and IR power sources, phased arrays, and optical spectrum analyzers.

13. Embedded Computer Software Technology

Planning for a new initiative that will provide an order of magnitude improvement in software programming productivity and reliability was initiated in FY 1980. A tri-Service coordinating committee has been established and qualified industry and university participants have been identified.

New concepts and methods will be sought as a basis for advances in software to complement the rapid progress in computer hardware which is expected to result from our VHSIC program. This initiative will build upon Ada, a high order language which has now been standardized by DoD. Applications of new software technology to command, control, and signal processing functions are planned for the second phase of the program.

F. THE DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

The primary role of the Defense Advanced Research Projects Agency (DARPA) is long-range research and development in pursuit of highly imaginative and innovative research ideas and concepts which offer significant military utility. Research and development options are not constrained by classic Military Service roles and missions nor operationally perceived requirements. Projects stress the technology by establishing demanding technical goals and are funded at critical levels to assure that these goals are not compromised by inadequate support but only by the limits of technical knowledge and human resources. This approach leads to an early determination of the technology payoff and an assessment of probable future success. This process converges towards selection of the most promising efforts and subsequent modest scale demonstrations for the assessment of potential military applications and the appropriateness of transfer to the Services.

1. Major Thrusts of FY 1982 Program

Highlights of the major thrusts of the DARPA program in FY 1982 are:

- Advanced Cruise Missile Technology - Under this thrust DARPA is developing critical technologies which provide alternatives to current cruise missile developments. Advanced airframe designs for enhanced survivability, high performance, high thrust-to-weight ratio engines for improved range/payload performance, and autonomous homing sensors for improved accuracy are being explored. To test survivability options, parallel investigations are proceeding in FY 1982 to explore detection phenomenology. Radar clutter is being examined across a broad frequency band.

Projected advancements in IR detection are incorporated in tradeoff evaluations of advanced techniques. Brassboards of active and passive sensors will be flight tested in FY 1982 for cruise missile autonomous homing. Jointly funded DARPA/Air Force engine options will enter full ground demonstrations.

- Directed Energy - This thrust addresses the critical technologies for feasibility demonstration of high energy laser technology for space-related applications and the Particle Beam Technology Program. The major effort is the high energy laser space defense research (Talon Gold, ALPHA, LODE). In FY 1982, construction of the Advanced Test Accelerator (ATA) for the Particle Beam Technology Program will be completed, and additional low energy beam propagation experiments will be conducted with the Experimental Test Accelerator (ETA).

- Space Surveillance - Programs within this thrust provide a broad technology base in visible, infrared and radar sensors for sophisticated future surveillance missions from space. Current technology development stresses infrared detector arrays with a high level of integrated signal processing, broad spectral selectivity and dynamic range, and high producibility for focal planes. Advanced filters and signal processing are under development for enhanced target detection in highly cluttered scenes. These sensors will provide improved surveillance. The Teal Ruby flight model sensor will be assembled, tested and integrated with the Air Force spacecraft.

- Naval Warfare - This thrust covers those technology efforts related to the surveillance and control of surface and subsurface ocean areas vital to the national security. Surveillance of current and projected Soviet strategic and tactical submarine forces and naval air and surface targets are included. The FY 1982 program includes investigations of low probability of intercept (LPI) shipboard air and surface search radars, advanced surface to air missiles, high altitude aircraft radar, and advanced anti-ship missile technology. Ongoing research will continue in the ASW acoustic and nonacoustic detection and tracking field. Advanced hydrodynamic hulls and propulsion concepts for undersea vehicles are under evaluation. Research is underway in shallow water detection techniques, advanced active acoustic submarine detection, fiber optics material and optical signal processing.

- Land Combat - Major technology efforts under this thrust are addressing the detection and destruction of massed armor under all weather, day/night operations; indirect fire weapons; and anti-armor warhead research. Technical emphasis is applied to small infrared focal plane array imaging and processing, millimeter wave targeting and guidance, advanced ramjet and sabot techniques for extended range projectiles. Much of this technology is being assembled in the Assault Breaker and Tank Breaker programs. The Assault Breaker system will be demonstrated in FY 1981 with the T-16 Patriot launch missile. In FY 1982 the weapons program will transfer to the Army and the associated Pave Mover Radar will transfer to the Air Force for engineering development. The Tank Breaker is an advanced candidate for the Army Infantry Man-Portable Anti-Tank Assault Weapons System (IMAAWS) mission. In FY 1982 this program will enter advanced development and testing in competition with other Army candidates for the IMAAWS mission. The Indirect Fire Cannon, with extended range fire-and-forget projectiles will enter the development and demonstration phase in FY 1982.

- Air Vehicles and Weapons - This thrust is directed to technological advancements leading to revolutionary new capabilities and improved aircraft and air-to-air defense systems performance. Included are the advanced X-Wing and Forward Swept Wing flight demonstrators. The X-Wing offers the potential for combining in one flight vehicle, the advantages of the vertical take-off and landing performance of the helicopter with the high subsonic speed capabilities of fixed wing aircraft. The Forward Swept Wing technology could demonstrate achievement of 20-30% weight and cost savings in the next generation of air superiority fighters. These two vehicles could make substantial contributions to the effective low cost force projection for rapid deployment forces. Fabrication of two Forward Swept Wing demonstrator models will commence in FY 1982. The complete rotor system for the X-Wing demonstrator will be fabricated and wind-tunnel tested in FY 1982. The FY 1982 program also continues promising research in rapid solidification of super alloys for jet engines, aluminum alloys for aircraft structures, and steel for bearings and gears.

- Command, Control and Communications - This thrust contains the congressional special interest strategic laser communications technology program. In FY 1982 an aircraft-to-submarine laser communications experiment will be conducted to verify propagation models for transmission through clouds and water. Additional efforts are devoted to the development of highly survivable and flexible computer-based architectures for future military command, control and communication systems. Packet switched communication provides the architectural basis for these efforts. Current research is being conducted on packet radio, network security, internetting, local network technology and the use of packet speech in integrated voice/data networks. Also included is a VLSI fast turnaround capability for rapid fabrication of custom high performance integrated circuits, permitting innovative architectures and system concepts for rapid integration into military C^3 systems. The use of distributed systems technology and automatic data processing on the battlefield is being evaluated by the Army XVIII Airborne Corps in a DARPA developed Army Data Distribution System Testbed at Fort Bragg, North Carolina. A joint program with the Air Force Strategic Air Command (SAC) will demonstrate air-to-ground packet radio communications and the use of distributed systems for survival and reconstitution of the SAC command control capability.

- Nuclear Test Verification - This thrust responds to national requirements in nuclear test detection and identification research to enhance the U.S. capability to verify existing and future test ban treaties. Programs within this thrust include: development of advanced sensors and instrumentation for deployment in remote areas, data reception, management and analysis, yield estimates of foreign underground explosions, countermeasures to evasive testing, and nonseismic techniques. In FY 1982, full scale laboratory testing of a miniaturized rugged broadband borehole seismometer and a sensor which combines strain and inertia data will be evaluated. New array concepts will be initiated for detection and identification of high frequency regional phases. Combinations of seismic and hydroacoustic sensors will be evaluated in an ocean based surveillance context. Under evasion and counter-evasive research, theoretical and experimental evaluation of tamped and cavity-decoupled explosive generation of seismic waves will be used for development of improved detection and identification methods.

- Technology Initiatives - This thrust contains those innovative research and technology seed efforts which are undergoing preliminary evaluation at modest funding levels prior to establishing a more comprehensive program under one of the other topical major thrusts. Current investigations include: methodology for design, verification and implementation of VLSI circuit architectures, computer science research in symbolic processing and intelligent computer systems, advanced image understanding techniques for use in intelligence and cartographic photo-interpretation applications, electromagnetic gun research, shock and combustion wave energy, electronic and optic materials research. A permeable base transistor developed under this thrust will be incorporated into an integrated wide bandwidth transmitter for packet radio evaluation. This transistor is capable of operating at 100 gigahertz or more with a 10 gigahertz bandwidth. Its power-delay product is two orders of magnitude less than that achieved with gallium arsenide field effect transistor logic, and it operates at room temperature. These improvements could result in an order of magnitude improvement in jamming resistance and covertness for military communications. The laboratory model of the electromotive force rail-gun will be operated with a 0.3 kilogram mass and is expected to achieve a muzzle velocity of 3 kilometers per second.

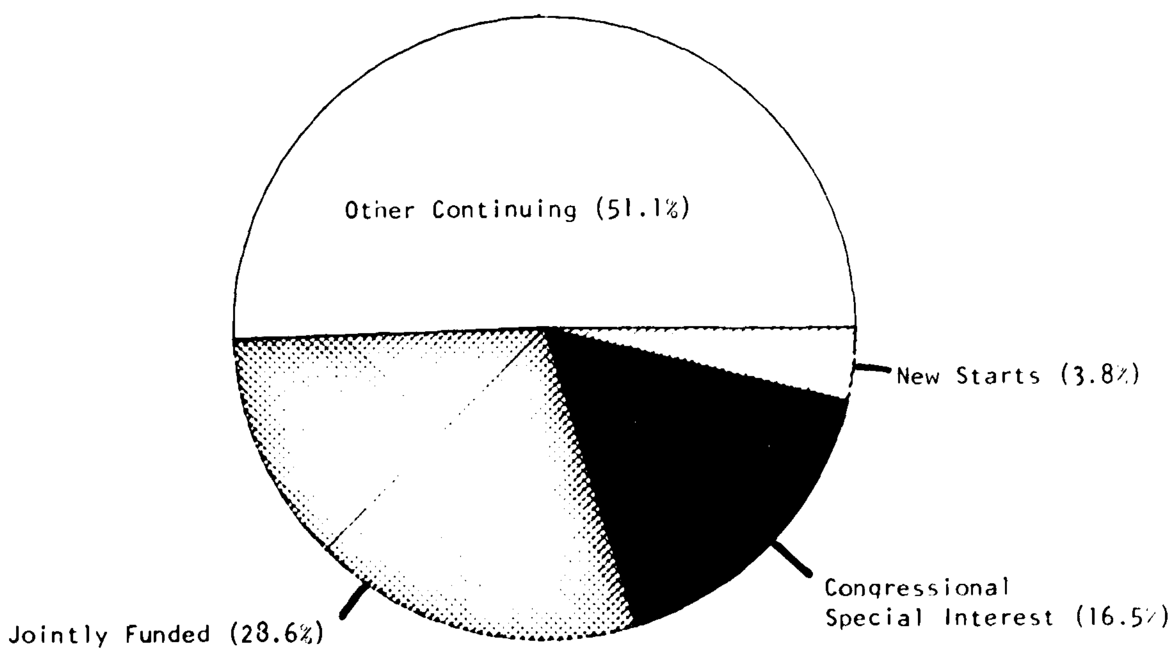
2. Budget Overview

The DARPA budget request for FY 1982 is $655 million. This is a 17.3 percent increase over the FY 1981 budget or a real growth of 7.9 percent when inflation is considered. The composition of the DARPA FY 1982 budget is shown in Figure V-1. Jointly funded programs are those technology efforts supported by both DARPA and the Military Services. These are largely research and development efforts which have progressed to the point where the Military Services perceive the potential contribution to their technology base for future mission options. All three Services are participating in these programs. Programs of special interest to the Congress are: Assault Breaker, Particle Beam Technology, Strategic Laser Communications and High

Energy Laser Space Defense. The jointly funded and special interest programs account for nearly half of the DARPA budget. Other continuing programs include incrementally funded multiyear research and development efforts and a number of the experimental evaluation of major innovative technologies (EEMIT) efforts which are in demonstration phases. These latter efforts are essential to successful transition of these technologies into the military departments. The buildup of these high interest and high technology payoff programs constrains the portion of the DARPA budget available for new research starts. DARPA is committed to the acceleration of technology transition of these major program efforts into the Services and increasing new research starts to approximately 10 percent of budget in the outyears.

FIGURE V-1

FY 1982 BUDGET COMPOSITION



3. Budget Trends

DARPA programs are conducted through contracts with industrial (63%), university and not-for-profit organizations in the private sector (23%), and with selected Service R&D laboratories (14%). These programs are executed through Service R&D organizations to augment technical review and coordination, and facilitate the eventual technology transfer to the appropriate Service. The FY 1982 budget request is consistent with the size and growth of the overall DoD Science and Technology program as it was last fiscal year. Over the past 10 year period, the DARPA budget has grown by only 4.4 percent per year, when inflation is taken into account. During this period, as shown in Table V-2, the research area has grown by only 2.5 percent, and the long-term Exploratory Development efforts have not grown at all.

Table V-2

Budget Summary

	Agency Fiscal Year ($ in Millions)			Agency Trends Annual Real Growth	
Major Programs	1972	1981	1982	FY 72-82 (Constant FY 72 $)	FY 81-82 (Constant FY 81 $)
Research	35.4	97.7	95.0	2.5%	(10.5%)
Exploratory Development	173.7	256.4	313.8	(1.6%)	12.6%
Experimental Eval. Projects	--	197.7	238.4	--	10.9%
Management Hdqtrs.	3.3	6.8	7.8	(.1%)	5.5%
TOTAL AGENCY	212.4	558.6	655.0	4.4%	7.9%
Agency budget as a percentage of DoD Science and Technology Program	14.7%	17.5%	17.3%		

G. DEFENSE NUCLEAR AGENCY

The Defense Nuclear Agency (DNA) is the DoD's principal source of nuclear effects knowledge, and conducts a comprehensive research program to assess the survivability of our military systems in a hostile nuclear environment, to predict the lethality criteria for confident destruction of enemy targets, and to develop technological capabilities that will enhance theater nuclear force effectiveness. The DNA development and test program spans the entire range of DoD nuclear weapons effects interest. Major activities include:

- Enduring C^3I. The effect of nuclear weapon detonations, particularly those occurring at high altitudes, is of continuing concern to the survivability and endurance of military communications, command, control and intelligence functions. DNA efforts include definition and mitigation of nuclear effects on: ground facilities and networks; satellites; signal propagation; infrared systems; and microelectronics. The most significant effort is development of a Satellite X-Ray Test Facility (SXTF) in which full-scale satellites will be exposed to threat relatable X-ray pulses in a simulated space environment. SXTF is being developed with a planned IOC of FY 1984.

- M-X Support. DNA continues its strong support of M-X. Nuclear flyout environment and survivability are being defined, as are Low Altitude Defense System (LoADS) nuclear threat environment and hardness issues. In FY 1982, simulators will be developed for M-X system validation testing, and extensive component testing will occur in dust, thermal, and X-ray environments. Additionally, a LoADS Nuclear Hardness and Survivability Plan will be synchronized with that of M-X.

- Theater Nuclear Warfare (TNW). The purpose of this DNA program is to improve the effectiveness, survivability, security, safety, and readiness of theater nuclear forces. Recent initiatives include support to improve the Navy TNW capability and support of the Pacific Command (PACOM) Theater Nuclear Force Improvement Program (TNFIP), including recommendations to optimize PACOM's TNF against the long-term threat. In the Theater Nuclear Force Survivability, Security, and Safety (TNFS^3) program, solutions are being developed to solve S^3 deficiencies by the mid-1980's.

- <u>Strategic Nuclear Warfare</u>. Efforts in this category include enhancement of nuclear survivability and effectiveness of strategic systems (aircraft, submarines, missiles) and the support of nuclear planning and targeting effectiveness. Recent evaluations include B-52 component blast and thermal vulnerability, Ground Launched Cruise Missile (GLCM) shelter blast tests, and cruise missile engine-blast and thermal tests. In FY 1982, the electromagnetic pulse (EMP) hardness maintenance/assurance methodology will be expanded to include blast and thermal effects on aircraft and the targeting assessment for nuclear anti-submarine warfare (ASW) weapons will be updated.

- <u>Underground Nuclear Testing (UGT)</u>. In FY 1981, the X-ray vulnerability of components of the M-X missile, Advanced Ballistic Reentry Vehicle (ABRV), Advanced Maneuvering Reentry Vehicle (AMaRV), and other systems will be evaluated during MINERS IRON. In FY 1982, HURON LANDING is scheduled for support of M-X, ABRV, Low Altitude Defense System (LoADS), and thermostructural phenomenology experiments.

- <u>Above Ground Simulation Testing</u>. DNA will continue efforts to lessen dependence on underground nuclear tests. Potential limitations imposed on underground tests by a Comprehensive Test Ban Treaty accentuate the importance of radiation simulators capable of operating at threat relatable X-ray levels. In late FY 1982, a DNA high explosive test (MILL RACE) will include large-scale thermal simulation to expose Army, Navy, and Air Force systems simultaneously to simulated nuclear blast and thermal pulses. Also, in FY 1982, the effects of atmospheric nuclear detonations on signal propagation will be simulated with an atmospheric barium release in the MIDNIGHT SKY experiment. In addition, there is an aggressive program to develop a laboratory simulation capability for missile and reentry vehicle hardness verification currently assessed only via underground tests.

The total DNA S&T funding request for FY 1982 is $234 million.

VI. STRATEGIC PROGRAMS

A. INTRODUCTION AND SUMMARY

The principal objective of our strategic nuclear forces, reaffirmed by PD-59, is deterrence of a nuclear attack on the United States, our allies, or others whose security is important to us. We plan to maintain the deterrent capability of the TRIAD because its separate forces with differing characteristics protect against breakthroughs in defensive technology and unanticipated failures in any one force component, thereby giving confidence that a significant fraction of our strategic capability will survive and be capable of effective retaliation. We also intend to improve the flexibility and endurance of our strategic systems in order to prepare for the possibility of protracted nuclear war.

The potential vulnerability of our existing silo-based ICBM force to a Soviet counterforce attack in the early-to-mid 1980's continues to be our major concern. Accordingly, rebasing a portion of our ICBM's for survivability is necessary if we are to continue to benefit from the unique advantages of the ICBM force (independence from tactical warning, endurance, reliable C^3, quick response, accuracy, rapid retargeting, high availability rate, and low operating costs). We are, therefore, continuing full scale development of the horizontal multiple protective shelter basing mode for M-X.

The SLBM force continues to be our most survivable TRIAD element and our current actions are designed to provide greater assurance that its survivability will endure. This will be accomplished through continued deployment of the longer range TRIDENT I missile which is being backfitted into POSEIDON submarines and will be deployed in the new quieter TRIDENT submarines.

In the air breathing element of the TRIAD we are completing development and have initiated procurement of the cruise missile. Its inherent penetration capability will assure the continued effectiveness of the strategic bomber force. In addition, cruise missiles give us the ability to expand rapidly the capability of the air breathing element of our strategic forces should that be required. We plan to add the Air Launched Cruise Missile (ALCM) to our current mix of Short Range Attack Missiles (SRAMs) and gravity bombs on our B-52's. We are studying various aircraft candidates, including new technology concepts such as low observable designs, to fill the missions of a Long Range Combat Aircraft (LRCA). The LRCA could provide the basis for a follow-on to the B-52.

We continue to rely primarily on strategic offensive forces to achieve strategic objectives. Our air defense forces are modest and we have chosen to dismantle our ABM defenses and rely on ABM Treaty constraints to avoid a mismatch with the Soviet Union. We are, however, placing emphasis on improving our warning and attack characterization capabilities. Long term developments are being initiated to provide adequate bomber and cruise missile warning and to achieve improved survivability and performance in both ground and space-based missile surveillance systems. Our Ballistic Missile Defense (BMD) technology efforts have been expanded with a major new focus on development of an option for low altitude defense of our land-based ICBM's.

The Soviets currently have an operational capability to attack some U.S. satellites. The United States possesses no such capability. Since we are becoming increasingly dependent on space assets we cannot accept this asymmetry. Accordingly, two efforts have been undertaken to work towards its elimination. First, a program to protect our satellites; second, the development of the capability to attack enemy satellites. At the same time, the U. S. is holding ASAT arms control talks with the Soviets which could lead to bilateral limitations on anti-satellite capabilities.

B. OFFENSIVE SYSTEMS

Our FY 1982 program for strategic offensive forces is structured to assure essential equivalence with the Soviet Union in order to deny them the opportunity to gain political or military advantage from their strategic forces.

1. Land Based Intercontinental Ballistic Missiles

The major thrust of our FY 1982 effort will be continuation of full scale development of the M-X system for long term survivability, continued deployment of the higher yield Mk-12A reentry vehicle on MINUTEMAN III, and better ICBM force command and control for the near to mid term.

a. M-X System

(RDT&E: $2408.7 Million)

The M-X missile uses three solid propellant booster motors having a uniform diameter of 92 inches. The fourth stage, or post boost vehicle, uses a liquid hypergolic propellant system and enables deployment of 12 Mk-12A reentry vehicles (the SALT II constrained number is 10 reentry vehicles).

The basing system for the M-X missile uses horizontal multiple protective shelters and a missile transporter vehicle separable from the encapsulated missile and launcher assembly. A back-up dash capability exists whenever these components are mated. When inside a transporter vehicle, each M-X missile will be able to visit any of approximately 23 shelters from a connecting surface road. At any selected shelter, the missile and launcher assembly can roll out of the vehicle into the shelter without detection. The transporter vehicle would then receive a mass simulator from that shelter and proceed to visit the remaining shelters available to it, pausing appropriately at each and generating the same signatures at each. Preservation of location uncertainty (PLU) will thus be established for the missile. PLU will be maintained or restored by repeating this placement procedure from time to time. Also, any selected number of missiles can be left inside their parked transporter vehicles, poised to dash on command to a shelter. The normal launch method requires the launcher assembly to roll the missile out of the shelter in cantilever fashion before erecting to the vertical for launch.

The M-X system is verifiable under the terms of SALT II. Verification is achieved through a combination of design and procedure. There are removable verification viewing ports in the roof of each shelter, spaced so that no ICBM could be hidden in the shelter once the ports had been removed. In addition, the missile and vehicle assembly and delivery procedures are slow, uniquely identifiable, and observable by national technical means of verification.

b. MINUTEMAN Improvements
(RDT&E: $33.6 Million, Procurement: $106.6 Million)

The yield of the MINUTEMAN III warhead is being increased in order to provide improved missile effectiveness. Development of the new warhead and the Mk-12A reentry vehicle have been completed and deployment of a total of 900 Mk-12A's on 300 missiles is underway.

The present MINUTEMAN force can be launched on command from Airborne Launch Control Centers (ALCC's); however, missile alert status is unknown to the ALCC in the absence of communications from the ground Launch Control Centers. Moreover, the force cannot be retargeted, beyond the limited pre-stored targets, from the ALCC. We are giving the ALCC the capabilities to determine missile status and to retarget missiles. We have a phased program for 200 Launch Facilities with the IOC for the first deployment in 1984.

We are also upgrading the Launch Control Center communications systems by installing connectivity to three new or improved systems: the Air Force Satellite Communications (AFSATCOM) System; the Survivable Low Frequency Communications System; and the Strategic Air Command Digital Information Network (SACDIN).

2. Sea Launched Ballistic Missiles

Deployed at sea, the SLBM force currently is essentially invulnerable to preemptive strike by opposing forces. However, this force is aging and its essential invulnerability is not absolute, nor will it last indefinitely. Therefore, we believe it is important to continue the modernization and replacement of these forces and to continue with improvements which add to their effectiveness as well as making the Soviet ASW task more difficult.

a. TRIDENT Program

(RDT&E: $104.2 Million, Procurement: $2263.5 Million)

The long range TRIDENT I missile will provide our SLBM forces greatly expanded operating areas, thereby enhancing their survivability.

This missile, which was first deployed on a backfitted POSEIDON SSBN in October 1979, has continued to exceed design accuracy and reliability requirements during 19 operational test firings. In January 1981, 5 of the 12 planned POSEIDON to TRIDENT conversions will have been completed. The remaining 7 conversions are scheduled to be completed by the end of FY 1982. We are continuing advanced development work on the Mk 500 EVADER maneuvering reentry vehicle and by early this year expect to attain an acquisition readiness posture should Soviet ABM developments require us to deploy the EVADER.

The new, quiet TRIDENT submarine will also increase the resistance of the SLBM force to ASW threats. We are concerned, however, about delays being experienced in the lead TRIDENT submarine (OHIO) construction. During CY 1980 the Electric Boat Division of General Dynamics Corporation announced schedule slips of OHIO which would delay the projected delivery date to July 1981 with initial deployment in April 1982. In view of the large number of scheduled SSN 688 Class deliveries at Electric Boat in 1981, the first follow-on TRIDENT submarine (MICHIGAN) will be delivered about twelve months after the OHIO.

b. SLBM Modernization
(RDT&E: $242.9 Million)

We have started development on a follow-on to the TRIDENT I (C-4) missile. The objectives of this program are to continue advanced development through FY 1983. We are defining approaches to maximize the accuracy, range, and payload parameters of a new TRIDENT II missile designed to fill the larger TRIDENT submarine launch tube envelope. We also plan to keep current the design for a long C-4 missile using improved missile technology and to develop missile guidance upgrade options applicable to the current C-4 and the long C-4. These developments will enhance the utility of our SLBM force by providing them a significant capability against the entire spectrum of Soviet targets. At the end of FY 1983 we expect to select one of the missile options. Program timing will be influenced by time phasing with the M-X and possible new bomber development.

The initial effort in this program is concentrating on development of selected guidance and propulsion components and systems to reduce the acquisition lead time following commitment to full scale development. This program will also support work, starting in FY 1982, to develop a GEOSAT satellite for launch in late 1983. GEOSAT will obtain necessary gravity data to reduce the impact errors contributed by present geodetic uncertainties and will provide us the information required to support missile flight tests. We will need the Congress' assistance in supporting our planned FY 1982 work by approval of an FY 1981 reprogramming request which was forwarded to the Armed Services and Appropriations Committees earlier this year.

c. <u>SSBN Security Technology Program (SSTP)</u>
<u>(RDT&E: $42.4 Million)</u>

The SSTP is the principal technology program for evaluating the extent to which existing and hypothetical ASW techniques can pose a threat to the continuing security of the SLBM force. Experiments and analysis of acoustic and non-acoustic signatures are focused on the question of whether specific characteristics of U. S. SSBN's can be exploited by the Soviets.

In FY 1982, the Navy will complete the analysis of the data collected during this year's experiment. The results will be used to make an assessment of any potential vulnerability. If early results point to a vulnerability, then work will begin to define countermeasures. The ability to locate and track SSBN's will be the subject of a major at-sea exercise in FY 1982. This effort is a continuation of past efforts involving the SSTP and DARPA.

3. Air Breathing Forces

We continue to advocate the concept of a mixed force of manned bombers and cruise missiles for the air breathing TRIAD element since a mixed force is much more stressing to the defense.

a. Air Launched Cruise Missile (ALCM)

(RDT&E: $70.6 Million, Procurement: $605.4 Million)

The ALCM/B-52 weapon system will constitute the primary component of the air breathing element of the TRIAD by the mid-1980s. The ALCM will provide an accurate, long range weapon to provide more effective targeting, routing flexibility, and reduced aircraft exposure to air defenses. It will improve the probability of penetration because of its greatly reduced signatures, its terrain-hugging flight path, and its ability to saturate local defenses.

The ALCM (AGM-86B), following a successful competitive fly-off in FY 1980, is now undergoing a 19 flight Follow-on Test and Evaluation (FOT&E) program (FY 1980-FY 1982) as part of the overall ALCM/B-52G integration effort. In FY 1982 the FOT&E program will be completed with the last five launches from a B-52G equipped with the Offensive Avionics System. Substantial efforts will continue in the development of ALCM support equipment and digital data bases (TERCOM maps, terrain elevation data, and vertical obstruction data) to support cruise missile employment. The FY 1982 procurement request will fund a 440 missile buy, associated support equipment, and initial spares. The ALCM/B-52G will meet the First Alert Capability (FAC) in September 1981 and the Initial Operational Capability (IOC) will occur in December 1982.

Details of the Ground Launched Cruise Missile (GLCM) and Sea Launched Cruise Missile (SLCM) programs can be found in Chapter VII (Tactical Programs).

b. Bomber Forces

The cruise missile launching and penetrating bomber will continue to comprise a major element of our strategic nuclear capability. To ensure a capable B-52 force, we will concentrate upon nuclear hardening (particularly for EMP), defensive electronic countermeasures versus the next generation Soviet threat, and reliability and supportability. Study efforts for the next generation multi-role bomber will concentrate on designs which provide a broad range of flexibility across a wide spectrum of missions.

(1) B-52 Squadrons
(RDT&E: $143.8 Million, Procurement: $511.6 Million)

This program provides for upgrading the B-52 to effectively perform its roles as a standoff cruise missile launcher and penetrator. The largest effort is for improving the offensive avionics which will provide an interface to cruise missiles and SRAMs, improve weapon system delivery performance, and reduce support costs. The test aircraft has been flying for the past eight months and the first alert aircraft, fully equipped with externally mounted cruise missiles, is scheduled for delivery to the Strategic Air Command in the fall of 1981. We have completed test and assessment analysis of the B-52 for nuclear hardness and defined a plan for EMP retrofit kit development. We also plan to continue upgrade of the existing B-52 electronic warfare (EW) equipment to maintain effectiveness against current and predicted airborne interceptor threats, primarily the Look Down/Shoot Down Interceptor and its complement of air-to-air missiles. The capability to neutralize the Soviet Union Airborne Warning and Control System (SUAWACS) is also being pursued under a separate program.

(2) Long Range Combat Aircraft

We are studying various aircraft candidates including FB-111B/C, B-1, B-1 derivatives, and new technology aircraft incorporating low observable designs, to fill the missions of a Long Range Combat Aircraft (LRCA). This aircraft should be capable across the broad range of missions such as force projection, conventional operations, cruise missile carriage, and nuclear weapon delivery. A separate report will be presented to the Congress by 15 March 1981 on the selected aircraft, comparing the military and cost effectiveness of each candidate. This report will also contain funding profiles for the selected aircraft. FY 1982 funding will be included in a Supplemental Request as soon as a final aircraft selection is made. The timing of a new bomber program must consider other high priority programs such as M-X, TRIDENT II, and ALCM, and our critical need for general purpose force modernization.

(3) KC-135 Squadrons

(RDT&E: $30.0 Million, Procurement: $31.5 Million)

The increasing demands for aerial refueling support require advances to increase the utility of our current KC-135 tanker force. Therefore, we are continuing the modification of the first production reengined KC-135. This reengining would: increase the fuel off-load capability; permit large fuel savings due to more modern, high efficiency engines; permit safer operations from shorter, hence more numerous, airfields; and reduce the environmental impact of operations. The CFM-56, a modern, high by-pass ratio engine jointly developed by U. S. General Electric and French SNECMA, has been selected for the reengining. Flight test is scheduled for 1983. Minimum procurement funding for follow-on production is being requested in FY 1982.

4. Advanced Ballistic Reentry Systems (ABRES)
(RDT&E: $50.0 Million)

The Air Force managed ABRES program has been the principal DoD effort to develop reentry technology in support of existing systems and to provide options for future requirements. ABRES is reducing its emphasis on reentry and is now turning its attention to broader problems related to the entire missile system. The Air Force, through the ABRES program, is carrying out a study to determine what missile systems will be needed in the future and to see how new technology could be applied to improve the performance of existing systems and those now in development. The major reentry activities left to be completed in ABRES are penetration aids for TRIDENT and M-X, demonstration of a weaponized ABRV configuration for possible use on M-X, and a new fuze for the ABRV which could also be used in the M-X reentry vehicle, the Mk-12A.

C. DEFENSIVE SYSTEMS

The basic elements of strategic defense consist of the surveillance and warning systems to detect and characterize hostile actions by strategic aircraft, missiles, or spacecraft, and the defensive weapons to counter these forces. Since the burden for deterrence is placed on our strategic offensive forces, only limited resources are being applied to developing defensive weapon systems. Nevertheless, we maintain a meaningful level of activity in this area to provide future options for defense should the need arise, and to be capable of effectively performing the surveillance and warning functions so that we can react to an attack in a timely fashion should deterrence fail.

Our warning programs are designed to improve our ability to detect and determine the character of a Soviet attack so that we could make use of available options for strategic response such as launching the alert bomber/tanker force. As a potential response to an increased Soviet threat to our land-based ICBM force, including M-X, one major focus of our BMD research and development program will provide us the option to deploy a BMD system should it be necessary to do so. In response to the Soviet anit-satellite interceptor we are developing technologies to make our satellites more survivable and have also initiated the development of an anti-satellite intercept system.

1. Warning

a. Bomber Warning

(RDT&E: $26.1 Million, Procurement: $50.6 Million)

The Distant Early Warning (DEW) Line was designed in the 1950's to provide long range early warning of medium and high altitude bomber attacks. It has gaps in coverage at low altitudes and is becoming expensive to maintain because of its age. We are continuing to evaluate alternatives to modernize and improve the DEW Line; however, we have temporarily suspended efforts to develop any new sensors.

To improve the capability of one of our warning systems and substantially reduce its operating costs, we have developed minimally-manned, technically improved long-range radars to be located in Alaska. The approach reduces the amount of equipment and the number of personnel required at each radar station. In FY 1982, operational testing of a prototype radar will be completed and production of the planned 13 units will be initiated.

The most promising near term technique for providing long range, all altitude aircraft coverage of the coastal approaches to North America is the Over-the-Horizon Backscatter (OTH-B) radar. We are pursuing a technical feasibility program to assess this application of OTH-B radar. In 1981, experiments at the site in Maine will be completed.

Technology and concepts for space-based detection and tracking of bomber and cruise missile threats are being developed to establish the viability of this potential alternative to ground-based radar. Space-based radar and infrared sensing concepts, being pursued jointly by DARPA and the Air Force, offer the potential of increased warning time and reduced vulnerability. The TEAL RUBY space experiment, scheduled for launch in three years, will provide proof-of-concept for space-based infrared bomber warning.

b. Missile Warning and Attack Characterization
(RDT&E: $195.0 Million, Procurement: $362.0 Million)

Recent studies have reaffirmed our need for reliable, survivable connectivity between warning systems and commands. Further, the need for more precise information in order to exercise appropriate responses to a strategic attack lead us to consider specific improvements to our warning radars and our satellite early warning system.

Today we rely primarily on our satellite early warning system for immediate warning of a ballistic missile attack on CONUS. Ground-based radars such as BMEWS, PARCS, and PAVE PAWS corroborate satellite data and provide additional data for missile warning and attack assessment.

Our satellite system consists of three satellites deployed in orbit over the Eastern and Western Hemispheres to cover Soviet ICBM and possible SLBM launch areas. While the system has performed admirably, it is nevertheless fragile. We have programmed the development of mobile (truck-mounted) ground terminals (MGT), easily proliferated and indistinguishable from other Service vans, that will solve our fixed CONUS critical node problem. Improvements that have been made to the satellite through the sensor evolutionary development (SED) task were directed principally at improving system resolution and extending the mean life of the satellite.

Early in FY 1980 we convened a DSARC to consider options for a follow-on satellite system. These options, concerned principally with survivability of space-based warning, have been carefully examined with respect to cost, risk, and availability. For the space segment, the DSARC decided that the best means to provide an essential near-term improvement in survivability with a high level of confidence and within fiscal constraints is to improve the system through several modifications. All satellites procured in FY 1982 and beyond will incorporate these survivability improvements.

To meet our projected replacement satellite need dates, we plan on procuring four satellites in a block buy, starting in FY 1982, with incremental funding through FY 1986. This approach, compared with the normal procurement of one satellite each year, has the cost advantage of buying several items at one time and will save approximately $134 million.

Satellite warning capability against ICBM attacks is reinforced by the BMEWS radars in Greenland, Alaska, and the United Kingdom. We plan to complete replacement of obsolete computers at all three sites and to upgrade the Thule, Greenland (Site I) radar to provide better attack characterization, especially for attacks against our MINUTEMAN force.

2. Ballistic Missile Defense

The Ballistic Missile Defense (BMD) program seeks to provide and maintain options for defense, maintain our lead in BMD technology, and encourage continued Soviet participation in strategic arms limitation efforts. By developing a broad technological base in BMD, we attempt to avoid any destabilizing technological surprise that might result from a Soviet lead. In addition, the BMD program provides valuable assistance in the evaluation of the U.S. strategic offensive forces and the assessment of Soviet BMD activity.

a. Ballistic Missile Defense Systems Technology (RDT&E: $215.8 Million)

The Systems Technology Program (STP) validates the performance of new concepts and technologies in a system context. This effort improves our capability to develop future BMD systems and preserves a capability to initiate rapidly the design and development of a system if required.

During the past year the Terminal Defense Validation Program with the Systems Technology Radar (STR) at Kwajalein Atoll was completed. The radar tracked several ballistic missile payloads of opportunity and was tested against two dedicated payloads designed to evaluate the capability to discriminate reentry vehicles from decoys in real time. These tests marked the completion of the program and the radar has been deactivated.

A key component of the Layered Defense System (LDS), which employs both exoatmospheric and endoatmospheric intercepts, is the non-nuclear exoatmospheric interceptor. Although the benefits of this type of interceptor are great, we have not yet demonstrated that it is feasible. A program to demonstrate the capability to destroy a reentry vehicle outside the atmosphere with a non-nuclear interceptor using a long-wave infrared (LWIR) homing sensor is underway. This program, the Homing Overlay Experiment (HOE), is a major thrust in the STP. During FY 1982 equipment assembly and testing will be completed and the first and second flight tests will occur.

In FY 1980 we initiated a pre-prototype demonstration program to resolve key system and sub-system issues, verify the feasibility, and assure that the option is available to develop and deploy rapidly a low altitude defense (LoAD) of hardened targets if required. The LoAD concept is characterized by small, relatively low-power radars and short-range, single-stage interceptors. The components are flexible and can be packaged for any of a number of missions; however, LoAD is particularly suited to provide a fully compatible defense option for MX in response to a very large growth in the threat. The pre-prototype demonstration program will be conducted in a manner consistent with the ABM Treaty and will demonstrate generic LoAD components.

During FY 1981 we will initiate design and verification testing of a number of components and will conduct a signature measurements program at Kwajalein Atoll to satisfy the need for low altitude signature data at the frequency of the LoAD radar. Design will continue in FY 1982 with preliminary design reviews scheduled for both the radar and interceptor.

b. Ballistic Missile Defense Advanced Technology RDT&E: $129.7 Million)

This program emphasizes the development and application of new technologies to reduce BMD costs, provide for more rapid deployment, and improve BMD performance. Major efforts are directed toward the development of conventional components such as radars, data processors, and interceptors; more advanced components such as mosaic optical sensors and laser radars; and the technology associated with BMD functions such as discrimination, tracking, guidance, and fuzing.

A technologically challenging component of the LDS is a forward acquisition missile-borne long-wave infrared probe that would perform the functions of warning and attack assessment. In FY 1982 the design and construction of ground-based equipment for a "hardware in the loop" simulation of critical functions will be continued and planning and assessment of a flight test program will be initiated. This effort will be supported by data gathered on a series of missile-borne infrared sensor flights at Kwajalein. This probe development will also be of general utility to our warning system development efforts. Another major effort in FY 1982 will be the continuation of the development of the technologies required to support the interception of reentry vehicles in the atmosphere with non-nuclear warheads.

3. Air Defense

(RDT&E: $1.4 Million, Procurement: $3.2 Million)

The emphasis of North American Air Defense continues to be to perform airspace surveillance and maintain airspace sovereignty in peacetime. In this regard, it is our objective to provide sufficient dedicated CONUS Air Defense forces to prevent unchallenged access to our airspace and to augment these forces in time of crisis with tactical forces to defend against limited bomber attacks.

The current North American Air Defense surveillance and control system is the aging SAGE/BUIC system which is costly to maintain because of large manpower requirements. To provide peacetime air surveillance and control at reduced cost and to provide an interface and transition to the E-3A (AWACS) for operations in time of crisis, we are implementing the Joint Surveillance System (JSS). This system will collect aircraft returns from many available ground radars and process the data in Region Operations Control Centers (ROCC's). A total of seven ROCC's are to be produced: four are to be installed in CONUS, one in Alaska, and two will be procured by Canada. Each ROCC in CONUS will process data from a network of FAA and USAF radars located on the periphery of the U. S. This will permit phasing out a large number of existing USAF SAGE radars with a resultant savings in excess of $100 million per year in operations and support costs. The bulk of the procurement will be completed in FY 1981. Software and integration tasks will be completed and all of the ROCC's will become operational in FY 1982.

4. Space Defense

The U. S. has become increasingly dependent on space systems for the effective use of our military forces. Currently, U. S. space systems provide support through communications, reconnaissance, ballistic missile early warning, navigation, treaty monitoring, nuclear detection and monitoring, and weather reporting. Many of the functions provided by space systems are unique in that the support cannot be efficiently provided by ground-based or airborne systems.

The Soviets have developed and tested an anti-satellite (ASAT) interceptor that has an operational capability against our satellites. The U. S., however, does not currently have an ASAT system, and an asymmetry exists. We hope that negotiations on ASAT limitations lead to strong symmetric controls. In the meantime, however, we have placed emphasis on our research and development activities to increase satellite survivability against attacks should they occur, and to be able to destroy Soviet satellites if necessary.

a. Space Surveillance

(RDT&E: $36.3 Million, Procurement: $24.2 Million)

The U. S. space surveillance network, known as the Space Detection and Tracking System (SPADATS), consists primarily of ground-based radar sensors. SPADATS can maintain the location of all important satellites; however, I consider our current space surveillance system to be only marginally capable of satisfying our near-term requirements and inadequate to support our future needs.

We are improving and deploying additional earth-based sensors for the near-term and, for the far-term, we are pursuing those

R&D efforts necessary for a space-based system. In order that we may detect and more readily monitor satellites we are procuring a global five-site Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) system. This system, when fully operational in the early 1980s, will permit observation of satellites up to geosynchronous altitudes (20,000 nm) when lighting and weather conditions are favorable. Since there are fundamental disadvantages of ground-based sensors for accomplishing the space surveillance missions, I believe that the long-term approach for responsive surveillance up to geosynchronous altitude is the use of space-borne LWIR sensors. We are conducting research and development on the critical technologies, such as the LWIR sensor and the cryogenic cooler, for such an approach and will launch Shuttle borne experiments in the mid-1980s to demonstrate the feasibility of this concept.

b. Satellite System Survivability
(RDT&E: $11.3 Million)

Techniques available for enhancing satellite system survivability include proliferating the number of satellites that perform a given mission, designing satellites so that they are not easily observed and placing them in orbits beyond sensor surveillance range, hardening satellites against laser radiation, and employing decoys to deceive or a maneuver capability to evade an attacking interceptor. Some of these concepts and technologies are being pursued within our survivability program.

c. ASAT Development
(RDT&E: $148.8 Million)

The primary U. S. ASAT effort is the development of a high technology interceptor using a miniature vehicle which, given its low weight, can be launched from an F-15 aircraft. The present development contract has an option for full-scale intercept tests in space.

d. <u>Space Defense Operations Center</u>

<u>(RDT&E: $24.1 Million, Procurement: $6.0 Million)</u>

Surveillance, satellite attack warning, and the command and control functions necessary to support either a response by our satellites or an ASAT attack of our own, must all be integrated into one center. Operational system specifications are being completed and hardware and software are being developed for the Mission Operations Center on a schedule to support the ASAT flight tests.

D. STRATEGIC C^3I

1. Strategic Requirements

The composition of our strategic forces is changing with the advent of new weapons systems. Full realization of the force capabilities being sought requires new initiatives in command, control and communications. Command and control functions must be survivable, enduring and support force employment policy. Survivable, jam-resistant, and secure means of passing Emergency Actions Messages (EAMs) and other information from the NCA to the strategic forces are required. In addition, it is a primary objective for our bomber, missile, and SSBN forces to have dependable two-way communications between the NCA and force commanders. This capability will support strategic policy and the efficient management of the Strategic Reserve Force.

2. Strategic Command and Control

a. E-4B Advanced Airborne Command Post (AABNCP)

The E-4B AABNCP is the best near-term prospect for achieving survivability of strategic command and control. Fixed command posts, even if hardened, are vulnerable to a concentrated nuclear attack. The E-4B AABNCP is a survivable emergency extension of the fixed command centers and provides higher confidence in our ability to manage strategic forces during a nuclear war.

Communications for the E-4B include SHF and UHF satellite communications terminals, a high-powered VLF/LF terminal, and improved communications processing. These systems have anti-jam features and will support operations in a nuclear environment over extended ranges. An austere, minimum essential ADP capability will become operational on the

E-4B in March 1981. The improvements, when installed in the full complement of six E-4B aircraft, will also permit a substantial reduction in currently operational CINCSAC airborne radio relay and auxilliary command post assets.

The test bed aircraft has been refurbished for operational use and has joined the National Emergency Airborne Command Post (NEACP) Fleet. Modification of the three current E-4A aircraft to the E-4B configuration will begin in FY 82 and be completed in FY 1985. The first two aircraft were funded in FY 80 and FY 81 and we are requesting $166 million in FY 1982 for the third aircraft. Procurement of two new E-4Bs is currently planned to be completed in FY 1986 and 1987, leading to full operational capability for both the CINCSAC and NEACP missions in FY 1987.

b. Enhanced Post-Attack WWMCCS Capabilities

A number of well conceived programs currently in execution are aimed at enhancing the survivability of WWMCCS elements in a wide spectrum of conflict. The Enhanced Post-Attack WWMCCS Capabilities Program addresses the endurance and reconstitutability and complements significant improvements intended by the other efforts.

The purpose of the program is to provide a systematic basis for assessing alternate investment concepts. Major emphasis will be placed on building advanced development hardware and feasibility models for test bed demonstration of the utility of the candidate concepts in field tests and exercises. This will provide technical risk, cost and operational utility data so that optimum investment decisions can be made.

c. E-3A Airborne Warning and Control System (AWACS)

If the North American Continent is attacked by air, AWACS (described more fully in Section VII.G.) will provide the survivable and mobile command and control functions for air defense intercept and augmentation fighter aircraft. AWACS regularly performs special airspace surveillance and air sovereignty functions in peacetime as an augmentation of the Joint Surveillance System.

3. Strategic Surveillance and Warning

a. Introduction

Deterrence is strengthened if potential adversaries know that we can detect, assess, and react appropriately to an attack. Major programs include systems to detect missiles, nuclear detonations and satellites. The Satellite early warning system, Over-the-Horizon Backscatter Radar, GEODSS and other initiatives to provide improved warning and characterization of missile and bomber attacks and space surveillance have already been described.

b. Integrated Operational NUDETS Detection System (IONDS)

Strategic surveillance also includes the capability to monitor effects of nuclear strikes, both those of an enemy against us, and by our weapons against enemy targets. The need for strike assessment capabilities is intensified by our doctrine of flexible response.

Real-time assessment of a nuclear attack anywhere in the world will be provided by the Integrated Operational NUDETS Detection System (IONDS). The IONDS concept involves deployment of sensors as secondary payloads on various host satellites, to detect, locate, and measure atmospheric and surface detonations of nuclear weapons, provide information via the World Wide Military Command and Control System (WWMCCS) for estimation of strike damage, and contribute to nuclear test ban treaty monitoring. We plan to install the IONDS detection sensors on NAVSTAR Global Positioning System (GPS) spacecraft.

4. Strategic Communications

a. The Strategic Satellite System

The Air Force Satellite Communications (AFSATCOM) system is designed to provide essential worldwide communications to strategic nuclear forces. The terrestrial segment consists primarily of terminals on B-52 and FB-111 bombers, EC-RC-135s, the E-4B, and TACAMO aircraft, and at ground command posts and ICBM launch control centers. Installation of the terminals is proceeding rapidly. The space segment consists of several components. One component is now operational and includes multi-channel transponders on FLTSATCOM and Satellite Data System (SDS) satellites and other spacecraft. The other component consists of single channel transponders on SDS and DSCS satellites.

We will need to replace and augment the links provided by FLTSATCOM satellites, which are not expected to function beyond the mid-1980s, and we need to provide the means for all strategic force components to have survivable two-way communications. We are examining alternatives to achieve this and will apply the techniques being considered to obtain the same type of improvements for tactical users. We are also examining the possibility of meeting the needs of tactical and strategic users with the same system. The initial results of these studies should be available early in 1981.

b. TACAMO

TACAMO is our principal survivable link to the fleet ballistic missile submarines. Currently, a CONCLANT TACAMO aircraft is airborne at all times to insure that Emergency Action Messages (EAMs) can be relayed to the Atlantic SSBN force. Deployment of TRIDENT submarines to the Pacific Ocean in the mid-1980s will increase the need for a survivable EAM relay in the Pacific. We are taking several actions to achieve this capability. We have been modifying existing airframes to extend their useful service life, and procuring in FY 1981 additional TACAMO aircraft to attain a fleet of 18. We plan to relocate the Guam TACAMO squadron to a West Coast base. Efforts to improve TACAMO VLF/LF communications continue, and we are increasing TACAMO functional survivability.

c. VLF/LF Communications

Key elements of the Minimum Essential Emergency Communications Network (MEECN) employ the Very Low Frequency (VLF) and Low Frequency (LF) communications bands because these frequencies support assured propagation paths in an environment which has been affected by nuclear detonations. Our ongoing programs in this area are aimed at increasing resistance to jamming, enhancing equipment reliability and maintainability, and improving functional capability, and will eventually entail upgrades for 209 ground receiver sites, 29 airborne command posts and relay aircraft, and 12 other facilities.

Full-scale development of a 100-kilowatt transmitter is underway, and will provide a 5-fold improvement in anti-jam performance, increased range, and substantially greater reliability than current equipment. We plan to start production in FY 1982. We are also developing improved receiving equipment, including a Transverse Electric antenna and diversity reception equipment for airborne installation. We expect to complete the antenna development in FY 1982 and the diversity equipment in FY 1984. In addition, we are studying the feasibility of extending the scope of VLF/LF communications through development of a miniature receiver terminal for the bomber force.

VII TACTICAL PROGRAMS

A. INTRODUCTION

The main objectives of our Tactical Research, Development, and Acquisition (RDA) programs are to maintain the military balance in Central Europe in both conventional and tactical nuclear warfare capability and to be ready to exert a stabilizing influence in other areas of the world that are deemed of vital interest to the US. Our RDA strategy is closely tied to the NATO Long Term Defense Plan and our plans for the Rapid Deployment Force. It takes into account the contributions of our allies, the balance between modernization and readiness, and the need for an affordable and cost-effective approach in the selection of new programs. It accepts a reasonable degree of concurrency in development and production to shorten the acquisition cycle while assuming prudent risks. The objectives of each of the major tactical RDA mission areas follow:

1. Theater Nuclear Forces

Our emphasis here is on the improvement of the flexibility, safety, security, and survivability of short and medium-range weapons and the acquisition of new long-range systems to counter the increasing capability of the Soviet forces to attack Western Europe with long-range nuclear weapons launched from the Soviet Union.

2. Land Warfare

Efforts in the land warfare area stress the development and acquisition of affordable, technologically advanced weapons to counter the adverse ratio of Soviet forces and the increasing sophistication of their weapon systems. Our efforts seek to gain the benefits of new technologies that enhance our capability to observe the battlefield and to deliver a variety of warheads against airborne and surface targets, with a high probability of single shot kill, even in conditions of poor visibility and countermeasures. Considerable emphasis is also being given to technologies that increase the battlefield effectiveness of our tactical warfare systems by increasing mobility, self-protection capability, reliability, maintainability, and durability.

3. Air Warfare

Our Air Force aircraft modernization program is now well under way and Navy/Marine Corps aircraft modernization is continuing. For the attack role, emphasis is now on improved weapons to achieve much higher effectiveness (through increased accuracy) and reduced aircraft attrition (through reduced exposure or stand-off). For the air superiority role, emphasis is now on improved radars and missiles to permit us to fight more effectively when outnumbered and when we must engage both fighter-bombers and their fighter escorts. For interdiction and naval strike we are developing medium and long range missile systems that can attack various land-based targets including airfields.

4. Naval Warfare

Programs in this area will improve our ability to protect shipping, support allies and overseas forces, and conduct offensive operations at sea. The greatest threat is posed by the anti-ship cruise missile launched from long-range, land-based aircraft such as the Backfire Bomber and from submarines or surface ships. To counter this threat, we are improving all components of our AAW "defense in depth."

Surface ship long-range attack capability is also being improved with the introduction of long range cruise missiles. We have a carefully focused program of ASW development to counter the advancing and considerable submarine threat.

5. Mobility

In the mobility mission area, we are taking steps to insure an adequate capability to respond rapidly not only to emergencies in NATO, but also to contingencies wherever they might occur. We are pursuing a program that balances our capabilities in airlift, sealift, and prepositioning of equipment and supplies on land and at sea.

6. Theater and Tactical Communications, Command and Control (C^3I)

Our programs in this area emphasize achievement of survivable worldwide force management capabilities; detection, location, and classification of enemy forces; tactical command and control systems that are interoperable between our Services and allies, and better tactical communications. Of particular note is the extension of our electronic warfare activities into the counter-C^3 area.

7. Summary

The programs which we plan are needed to meet our security goals. We will seek to exploit our technology, but with proper regard for cost since power comes from quantity as well as quality of forces. The sections which follow contain specific information about our acquisition strategy and key programs arranged by major mission areas.

B. THEATER NUCLEAR FORCES (TNF)

1. Introduction

Theater Nuclear Forces (TNF) are the link between conventional and strategic nuclear forces. As such, they are intended to deter and, should deterrence fail, to respond flexibly to blunt conventional and nuclear attacks at a level of conflict below strategic warfare. TNF also can contribute to the conventional defense by placing the full range of Warsaw Pact forces at risk. They provide an incentive for dispersal of enemy forces, and the capability to attack a variety of selected targets throughout the theater. Through deployment of a spectrum of TNF capabilities and systems, we deny any decisive advantage by the first use of nuclear weapons in the theater.

Plans for modernization of theater nuclear forces have been developed in close coordination with our NATO allies. We regard it as essential that other NATO countries share in the planning, the responsibility and the cost of TNF modernization. Such a coordinated approach is important to Alliance solidarity and to the credibility of our deterrent. In recent years Soviet modernization of long range theater nuclear forces -- particularly the SS-20 ballistic missile and the BACKFIRE bomber -- raised issues concerning that credibility. As a result, NATO Foreign and Defense Ministers approved, in 1979, the deployment of 464 Ground Launched Cruise Missiles (GLCM) and the replacement of 108 U.S. Pershing Ia missiles on launchers and their reloads with Pershing II. Both deployments will begin in late 1983. At the same time the ministers agreed to pursue arms control negotiations on land based long-range TNF systems within the framework of SALT III. Both the modernization and arms control initiatives are being pursued vigorously. As an integral part of TNF modernization, we and our allies have agreed to withdraw 1,000 nuclear warheads from Europe. This withdrawal began in April 1980 and was completed in December 1980.

2. Battlefield Systems

a. Strategy

Battlefield Theater Nuclear Weapon (TNW) systems are those normally associated with the Division and Corps level. Future systems in this category require enhanced survivability, responsiveness, and accuracy.

Current NATO battlefield capabilities include 8-inch and 155mm nuclear cannon artillery projectiles and Lance surface-to-surface missiles. We plan to retain these systems and increase their effectiveness by selective improvements in range and warhead design.

b. Key Programs

(1) 8-Inch Artillery Projectile

A new 8-inch projectile, now in engineering development, will provide needed improvements. It does not require field assembly; eliminates the need for a spotting round; has increased range (29 vs 18 kilometers); offers an option for enhanced radiation (ER) should the President authorize it; is more survivable; and includes improved fuzing, safety devices and security features. The FY 1982 DoD budget request is $16.9 million for procurement.

(2) 155mm Artillery Projectile

A new 155mm artillery projectile is in an earlier stage of engineering development. This weapon will also provide improvements in range, accuracy, yield, fuzing, and denial disablement features.

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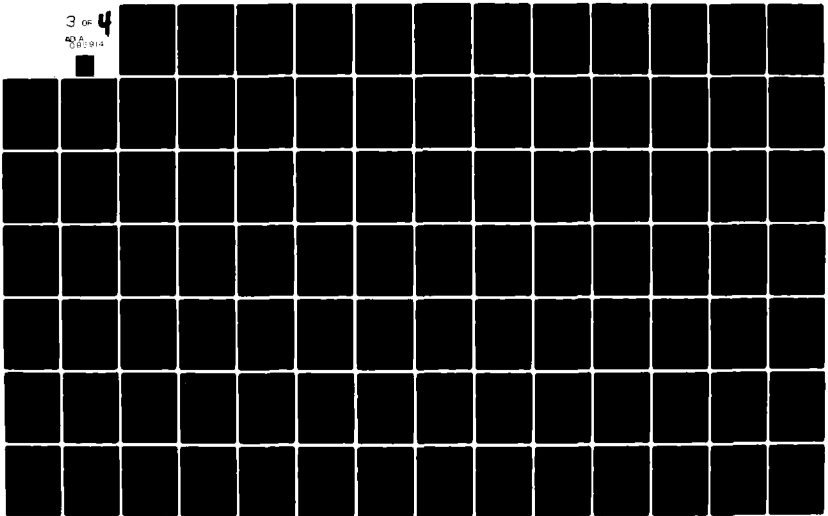

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The Rocket Assisted Projectile (RAP) module will provide an extended range for both the M198 howitzer the M109A1 howitzer. This program has been deferred so no funds are included in the FY 1982 budget request.

(3) Nuclear Lance

Nuclear Lance is currently deployed with U.S. and other NATO forces. Production of improved Lance warheads is underway. Enhanced radiation features can be incorporated in these warheads, if approved by the President.

(4) Corps Support Weapon System (CSWS)

The Corps Support Weapon System (CSWS) is an Army artillery missile system with the mission of interdicting surface-to-air missile systems and second echelon enemy forces. The CSWS is expected to be a dual-capable system capable of delivering conventional anti-material, anti-armor (Assault Breaker), nuclear, and chemical warheads. The Army currently envisions CSWS to replace the current LANCE. The Defense Advanced Research Projects Agency (DARPA) has been working on the Assault Breaker anti-armor guided submunition and the Air Force has been developing the Pave Mover radar required for target acquisition. A series of firing demonstrations is scheduled that will clarify a number of technical issues concerning both the Assault Breaker concept and the Pave Mover and submunition technologies. The FY 1982 budget request contains $20M for RDT&E for the CSWS. The Assault Breaker program is discussed further in Section D below.

3. Theater-wide Systems

a. Strategy

Theater-wide TNW system provides capabilities and options for deep nuclear strikes as well as shorter range missions throughout the theater. This mission area includes land and carrier-based dual capable aircraft, the Pershing Ia ballistic missile and submarine-launched ballistic missiles allocated to the theater mission. The current force has several limitations: aircraft are subject to attrition; Pershing Ia cannot reach deep targets; and MIRV footprint characteristics limit the Poseidon capability to attack widely dispersed targets. Current systems also have limited accuracy, restricting their capability against hard targets and necessitating yields which produce relatively high levels of collateral damage. These limitations, in conjunction with the increasing Warsaw Pact threat, prompted NATO's 1979 decision on long range TNF modernization of land based systems. Modernization of our theater-wide systems includes:

- o Increase in the range capability of our systems to reach high value military targets extending into the Soviet Union.
- o Increase in system accuracy to enhance the capability to attack targets while minimizing collateral effects.
- o Improvement in survivability of TNF under nuclear or nonnuclear attack through greater mobility, increased hardness, and dispersal.
- o Upgrade of Communications, Command and Control (C^3) systems to maintain responsiveness of TNF to military and political authorities.
- o Enhancement of security and safety of nuclear weapons against the spectrum of threats including terrorists, enemy agents, and special forces.

b. Key Programs

(1) Pershing II

Pershing II can be used for both selective or general nuclear release options against fixed targets such as lines of communications, logistics facilities, airfields, command posts and stationary tactical targets such as staging and assembly areas.

Pershing II, a follow-on to the shorter-range Pershing Ia (PIa), will have a longer range, a December 1983 IOC in Europe, and will use a modified PIa erector launcher. Upgraded ground support equipment will improve command and control and reduce manpower requirements. A new re-entry vehicle will incorporate a precision terminal guidance system. Development of the earth penetrator warhead for PII has been terminated. RDT&E funding of $158.8 million and $91.7 million for procurement is requested for FY 1982.

(2) Ground Launched Cruise Missile (GLCM)

The GLCM consists of the Tomahawk missile, integrated on an air transportable, ground mobile launcher unit. Together with its launch control van, it will be protected in its peacetime location by a hardened shelter. The ground mobile capability will enhance prelaunch survivability when deployed.

The GLCM can be used for both selective or general nuclear release options against fixed targets such as lines of communications, logistics facilities, airfields, command posts and stationary tactical targets such as staging and assembly areas. The GLCM, with a nuclear warhead, preprogrammed targeting, and quick reaction, all-weather capability can provide increased firepower and improve the non-nuclear force levels by releasing quick reaction alert aircraft for other than nuclear tasking.

The GLCM system is presently in engineering development. One GLCM flight test, using engineering test units, was successfully completed in FY 1980. Full system tests will be conducted in FY 1982-1983 with two contractor flight tests followed by eight Air Force flight tests. The Initial Operational Capability (IOC) is planned for December 1983. $53.2 million is requested in FY 1982 for RDT&E and $331.7 million for procurement of 54 missiles and associated equipment.

(3) Sea-Launched Cruise Missile (SLCM)

The SLCM program is nearing the end of its development. Tomahawk variants include the conventionally armed land attack missile (TLAM/C), and the conventionally armed antiship missile (TASM) (both discussed in later sections). We are also developing a nuclear land attack variant (TLAM/N) which would give the Navy a more survivable worldwide theater nuclear force capability and preserve the option for its deployment in FY 1984. $119.9 million for RDT&E and $128.1 million for procurement of 48 SLCM of all types and $62.8 million for procurement of ordnance support equipment is requested in FY 1982.

(4) Dual Capable Aircraft - Tactical Bombs

The tactical bomb stockpile which supports NATO and U.S. worldwide requirements for theater use is being significantly upgraded. These systems have enhanced safety and security features. The Department of Energy has also requested funds in FY 1982 to begin a Stockpile Improvement Program which will retrofit the older versions of B61 bombs with enhanced security, safety, and command and control features. All forward-deployed tactical B61 bombs will be upgraded under this DoE/DoD program.

4. Sea Control Systems

Sea Control TNW includes fleet anti-air, anti-submarine and anti-surface ship systems including ASROC, SUBROC, TERRIER, and air-delivered depth bombs. In addition, carrier based nuclear bombs, although normally included in theater-wide systems, contribute to sea control through their ability to counter hostile surface ships. As part of our continuing assessment of the future role and utility of naval nuclear systems we have initiated, in conjunction with the Department of Energy, a feasiblity study to define a potential warhead for the ASW Standoff Weapon. This is a multi-platform weapon to be deployed in the late 1980's with either a nuclear warhead or an Advanced Lightweight Torpedo as a payload.

5. Theater Nuclear Forces Survivability, Security, and Safety ($TNFS^3$)

As we continue to pursue more survivable and ready theater nuclear forces (along with improvements such as increased mobility and continuously mated warheads), we must continue to concern ourselves with the peacetime environment. We are therefore placing emphasis, in coordination with the Department of Energy, on measures to insure that our theater nuclear systems remain safe, secure, and survivable. Some of the improvement now being included or considered for inclusion in our newer theater nuclear system are: insensitive high explosive to reduce the risk that an accident or terrorist act could detonate the high explosive in a nuclear weapon; improved Permissive Action Link (PAL); enhanced electrical safety features and packaging intended to reduce still further the potential for accidental arming or detonation through abnormal environments; and continuing storage site security upgrade and tranportation safety and security features which are intended to defend against terrorist action. In addition, we are also continuing efforts to enhance the wartime survivability of TNF.

C. LAND WARFARE

1. Introduction

Land Warfare encompasses conventional weapons used by, and in direct support of, ground forces of the Army and Marine Corps. We retain a major emphasis on NATO, where the objective is to deter aggression by Warsaw Pact countries. In addition, to support our vital interests in areas other than NATO, efforts are underway to equip a Rapid Deployment Force with equipment that is strategically mobile and tactically effective. The following subsections describe land warfare mission area objectives and highlight the major programs.

2. Close Combat

a. Strategy

The major goal with regard to Close Combat is the acquisition of significantly improved weapons for our armored and infantry units thus attaining combined arms forces capable of successfully engaging a numerically superior force, usually armored. We seek to accomplish this by overcoming the larger enemy force with weapons which have enhanced accuracy and lethality, yet provide excellent protection. We seek not to allow our drive for high quality weapons to increase their costs to the point where we cannot acquire the quantity of systems needed. Our aim is to find the most effective and efficient mix of tanks, fighting vehicle systems, improved light antitank weapons, antitank missiles, attack helicopters, and high mobility vehicles in the numbers needed to meet the numerically superior threat force.

b. Key Programs

(1) XM1 Tank and Main Gun

Development and fielding of the XM1 tank as a modern, affordable replacement for obsolescent M48 and M60 tanks continues to be our highest priority objective. To achieve the earliest possible fielding of the tank, the program has included some concurrency of development and procurement. This approach has the disadvantage of schedule delays when problems are encountered; however, overall, it has shortened the time to field the system. Extensive testing has demonstrated the capability of the XM1 to meet its firepower, survivability, and mobility goals. While initial tests of the protytpe tanks revealed deficiencies in reliability and durability, modifications to correct these problems were developed. Recent tests of modified prototype tanks demonstrated mission reliability which exceeded the requirement by 20 percent. The low rate production deliveries began on schedule in February 1980. Tests of the early production tanks are in progress to demonstrate that the stringent reliability, maintainability, and durability goals are met prior to commencement of high rate production. We are requesting $29.1 million for RDT&E and $1307.0 million for procurement of 569 tanks in FY 1982, including $218.1 million for advance procurement and $45.1 million for training equipment.

We are requesting $10.2 million in FY 1982 for development of operational system improvements to the tank, including increased nuclear, biological, and chemical protection, an auxiliary power system, and increased armor protection. The program to acquire and integrate the German 120mm smooth bore gun system for future use on the XM1 tank is continuing with a goal of first production delivery of the 120mm equippped M1A1 tank in August 1984. In FY 1982, we are requesting $84.6 million for RDT&E and $36.3 million for procurement of the 120mm gun, ammunition, and integration into the XM1.

(2) Fighting Vehicle System (FVS)

The FVS includes the Infantry Fighting Vehicle (IFV) and the Cavalry Fighting Vehicle (CFV). Together they will provide the mechanized infantry forces an armored squad carrier that has significantly increased firepower, mobility, and armor protection compared to the present M-113. The FVS provides an effective companion vehicle for the XM1 tank. The IFV will replace the M-113 armored personnel carrier in selected mechanized infantry units in the European theater. For operations in a nuclear, biological, chemical (NBC) environment, the FVS provides ventilated fac ieces and protective clothing for the crew and individual masks and protective clothing for the remainder of the squad. The CFV will be issued to cavalry units for armored reconnaissance scout roles. Both vehicles will mount an automatic 25mm cannon and the tube launched, optically tracked, wire guided missile (TOW) weapon system. The FVS program completed its operational test and evaluation in FY 1980. Concurrency of development and procurement is necessary to meet the May 1981 production start directed by Congress and to shorten the fielding schedule for this urgently required weapon system by at least 30 months. The IOC date for this program is October 1982. The FY 1982 funding request is $57.8 million for RDT&E and $699.8 million for procurement of 464 vehicles and initiation of second source activities.

(3) Improved Light Antitank Weapon (VIPER)

The Improved Light Antitank Weapon (VIPER) is a lightweight, short-range, shoulder-fired antitank weapon to replace the M72A2 Light Antitank Weapon (LAW), which is comparatively deficient in range, accuracy, and lethality. Development of the VIPER will be completed and procurement initiated in FY 1981. The FY 1982 procurement request of $53.6 million will buy 80,000 VIPERS. Inventory shortfall of M72A2 LAWs, resulted in the decision to procure 100,000 Norwegian LAWs in FY 1981 as an interim measure.

(4) Antitank Guided Missiles (ATGM)

The tube launched, optically tracked, wire guided missile (TOW) is the main infantry antitank guided weapon of the U.S. Army. Growth in armor protection and the ability of the Warsaw Pact tanks to work in obscurants has made it necessary to implement a significant product improvement program to retrofit existing TOW stocks. The improvements will be accomplished in two steps. First, an improved 5-inch warhead will be fielded in FY 1981. Second, a 6-inch warhead version that includes the capability to operate under adverse visibility will be developed. The FY 1982 RDT&E funding request for these TOW improvements is $20.7 million. A medium-range antitank guided missile replacement program was launched in 1979 as detailed in the Precision Guided Munitions section. This effort is now oriented toward developing an Infantry Manportable Anti-armor/Assault Weapon (IMAAWS), in accordance with an agreement for a cooperative program with our allies in which they will develop the heavier TOW replacement.

(5) Advanced Attack Helicopter (AAH)

The AAH is a two-place twin engine helicopter specifically designed to deliver anti-armor and area suppression fires in day, night, and adverse weather conditions. The program is in the final stages of its engineering development. Flight testing began in FY 1979 for evaluations of flying qualities and for armament and fire control system surveys using the two Phase I prototype aircraft. Three engineering development (Phase II) YAH-64 models joined the flight test program in FY 1980. The aircraft performance testing is now essentially finished. During FY 1980, highly successful day and night launches of the Hellfire missile from the YAH-64 were accomplished with the on-board Target Acquisition and Designation Sight (TADS) providing the laser designation. More testing remains to be done in the area of armament sub-system integration before proceeding into production in late 1981.

On 22 November 1980, a mid-air collision between a YAH-64 prototype and its chase plane caused the loss of both aircraft. The remaining test workload has been redistributed among the other prototype aircraft to accommodate this loss with a minimal schedule impact.

The FY 1982 RDT&E request is $94.0 million. Procurement request is $365.5 million for the initial buy of eight aircraft, spares, and long lead items. The IOC for the AAH is January 1985.

(6) Hellfire and Fire-and-Forget Hellfire

In 1976 the DSARC approved full-scale engineering development of the Hellfire Modular Missile for use on the AAH. Compared to the Cobra/TOW, AAH/Hellfire will have significantly enhanced effectiveness and survivability. The 7-inch Hellfire warhead will be highly effective against present and near-term future types of armor. The laser Hellfire will enter production in FY 1982.

To provide a Fire-and-Forget capability, the full-scale engineering development of an Imaging Infrared (IIR) seeker will be initiated in late FY 1981. This represents an improvement over Laser

Hellfire from three points of view: AAH survivability, target service rate, and weather/battlefield obscurants performance. The Army has been directed to pursue a seeker design approach which will yield improved performance as compared with the Maverick IIR seeker (better sensitivity, lower cost, and lower weight). This seeker will be compatible with Maverick and allow for future growth to full focal plane arrays with very little design change.

RDT&E funding of $24.7 million for Laser Hellfire and $28.4 million for an IIR seeker is requested for FY 1982. Production funding of $132.5 million is requested for Laser Hellfire initial production in FY 1982. The IOC date for Laser Hellfire is January 1985. The Fire-and-Forget Hellfire has a projected IOC of September 1985.

(7) High Mobility Multipurpose Wheeled Vehicle

This multi-Service program will test, evaluate, and procure highly mobile wheeled vehicles to replace the two jeeps and a trailer presently used to transport a TOW weapons system in the light divisions and to perform a variety of combat support and combat service support roles. This vehicle provides a significantly greater degree of protection and mobility and will be a workhorse for the airborne divisions and the rapid deployment forces. The RDT&E funding request for FY 1982 is $3.1 million. Procurement will commence in FY 1982 with funding of $22.6 million (Army, Air Force, and Marine Corps) for tooling, facilitization, and the buy of 796 vehicles. The IOC date for the vehicle is 1984.

3. Fire Support

a. Strategy

The direct fire anti-armor capability of the close combat forces (the armored, mechanized, and infantry divisions) must be augmented by indirect fire (artillery, and missiles) and close air support aircraft. Only such a combination can mass adequate firepower in a timely manner at critical points along the front. U.S. technological superiority in precision guided weapons is being applied to provide our fire support arms with a significantly improved capability to attack armored targets.

b. Key Programs

(1) Copperhead

The Copperhead laser guided projectile will give the artillery a significant improvement in capability using existing howitzers and personnel. It will permit artillery to achieve a hit with one or two rounds, destroying or neutralizing moving and stationary hard point targets, such as armored and mechanized vehicles, and fortifications. The 155mm Copperhead completed full-scale engineering development in 1979 and entered limited rate production. The IOC is scheduled for August 1981. For FY 1982, $3.4 million is requested for RDT&E and $127.5 million is requested for the procurement of 5,229 rounds.

(2) Multiple Launch Rocket System (MLRS)

MLRS is a joint, four-power development involving the U.S., The Federal Republic of Germany, France, and the United Kingdom. A Memorandum of Understanding has been signed by the four parties that describes the design, development, and production programs to satisfy tactical requirements of all four nations. MLRS will enhance our fire support capability for counterbattery and air defense suppression, especially during surge conditions and at longer ranges than currently possible with tube artillery. The system will have provisions for operating in nuclear and chemical environments.

The rocket is of a modular design to accommodate different warheads. Initial MLRS payload will consist of the submunitions used in the 155mm and 8-inch Improved Conventional Munitions. Commonality with the artillery rounds results in lower cost and improves the ammunition production base. The Federal Republic of Germany is pursuing a program for the development of a mine warhead using the German AT II Antitank Mine and the four nations involved are planning for co-development of a Terminally Guided Warhead (TGW).

The FY 1982 RDT&E request is $36.1 million to continue system development and maturation, while $210.7 million is requested for procurement of 68 launchers and 2,496 rockets.

(3) Rocket Assisted Projectiles (RAP)

To achieve greater range for the Army's 155mm and 8-inch howitzers, a rocket assisted projectile (RAP) for each has been developed and is currently being procured. The 155mm High Explosive RAP round (M549) is a separately loaded projectile composed of two distinct components: the warhead (projectile) and rocket motor. This round can be fired from existing gun systems. The 8-inch High Explosive RAP round (M650) is used with the M110A1/A2 self-propelled howitzers and the M115 towed howitzer. In FY 1982, $21.5 million is requested for the purchase of 30,000 155mm rounds and $45.9 million for the purchase of 31,000 8-inch rounds.

(4) Precision Guided Munitions (PGMs)

The family of precision guided munitions being developed by the Services can be delineated into two classes--those requiring laser designation of the target for their terminal guidance and those not requiring such designation. The systems now fielded, or in final phases of development, need laser designation to achieve aim point data. The new technology weapons will discriminate targets without a designator in the loop during the final encounter. In either case, terminally guided munitions offer a significantly improved single shot kill capability over existing warheads/munitions. Further, because the projected trends in tanks (T-72, T-80) point to increased target protection in the ground plane due to increased armor efficiency, some of the new PGM systems exploit the target's topside vulnerability.

Application of advanced sensor and warhead technology has lead to systems specially tailored to mission requirements. The Infantry Manportable Anti-Armor Assault Weapon System (IMAAWS) applies this technology to the close combat mission. Fire Support munitions now include the Search and Destroy Armor (SADARM), Anti-Radiation Projectile (ARP), and Terminally Guided Warhead for the Multiple Launched Rocket System (MLRS). Related programs are the Assault Breaker/Corps Support Weapon System, and the Air Force Wide Area Anti-Armor Munitions (WAAM) projects. These latter systems are described under the Air Warfare section.

Because of the failure of initial system concepts to meet user weight and size requirements, the IMAAWS project was restructured. A new requirements analysis will be conducted and contracts for feasibility demonstrations awarded in the fourth quarter of 1981. The competitive programs are utilizing advanced warhead and fuzing technologies--

millimeter wave/infrared sensors, warheads with self-forging fragments, mature shaped charge warheads, and laser guidance. In FY 1982, $54.6 million is requested for IMAAWS development.

The SADARM employs submunitions which are ejected from a standard 8" artillery projectile over a target area. Each submunition is affixed to a parachute which will enable an active/passive millimeter wave sensor to search a target area in an Archimedes spiral as the submunition descends. Upon detection and classification, a self-forging kinetic energy fragmenting warhead is fired at the top of the target. $18.8 million is requested for RDT&E in FY 1982.

The Terminally Guided Warhead for the MLRS project is a joint technology program among the US, Federal Republic of Germany, the United Kingdom, and France. Funding was appropriated in FY 1980 to start efforts to adapt the Assault Breaker warhead technology to the MLRS terminally guided submunition. In FY 1982, $4.1 million is requested to continue this program.

The Anti-Radiation Projectile (ARP) is a rocket-boosted guided projectile which is fired from the currently fielded 8-inch howitzers. It will passively home to the emissions from radars and will be used to suppress mobile SAMs, counterbattery, and other radars. In FY 1982, $18.4 million RDT&E is requested to support fabrication and testing of an advanced development baseline system.

4. Ground Air Defense

a. Strategy

The Army in the field must have adequate air defense which, when coupled with the air defense capabilities of the U.S. Air Force, is able to prevent the air threat from destroying significant quantities of critical friendly assets or seriously limiting the maneuverability of friendly forces. For this, a family of air defense weapons is required, including: low-altitude, short-range weapons for area and point-defense (SHORADS); larger, more complex surface-to-air missiles to provide area coverage at High and Medium altitudes (HIMAD); and manned interceptors/ air superiority aircraft to defend the outlying air space and to counter massed air attacks in a role complementary to the ground-based air defense systems. Since the air threat continues to increase, we must continue to improve fielded systems and support a major modernization program that will eventually replace the present ground air defense system.

b. Key Programs

(1) Medium/High Altitude Air Defense

(a) Patriot

The Patriot, a surface-to-air missile system, will replace the Nike Hercules and Improved Hawk. It will provide greatly increased capabilities to include improved Electronic Counter-Counter-Measures (ECCM) and simultaneous engagement capability.

The Patriot system completed DT/OT II testing in September 1980. While the overall system capabilities were demonstrated, shortfalls surfaced in software and Reliability, Availability, and Maintainability (RAM).

A limited production was authorized in October 1980 with an annual rate of no more than 6 fire units and 130 missiles until such time that development shortfalls detected in the test program are corrected and certain specific performance goals demonstrated. FY 1982 RDT&E funds of $32.6 million are requested to correct problems detected during DT/OT II and to improve further the system's capability to operate in the projected heavy ECM environment. The FY 1982 procurement request of $486.1 million is for procurement of 6 fire units.

(b) Improved Hawk

There will be significant Hawk quantities in the inventory until the late 1980's. While missile procurement was completed in FY 1980, product improvements continue to enhance the system performance, extend its life, and increase its effectiveness in Electronic Countermeasures (ECM) environment. The improved HAWK is the only medium to high altitude air defense system available to the RDF. In FY 1982, $30.2 million is requested for development of performance enhancement items, and $21.2 million is requested for procurement of ECCM modification kits.

(2) Short-Range Air Defense

(a) US Roland

US Roland is an all-weather air defense missile system that supplements the Chaparral in the Corps and rear areas. Low rate production contract was signed in 1979 with 810 missiles procured through the FY 1980 funded delivery period. Due to funding limitations, no procurement beyond FY 1981 is planned.

(b) Division Air Defense Gun (DIVAD)

The Division Air Defense Gun program will provide a ground-based air defense system capable of operating with the forward combat elements and providing protection from fixed and rotary wing aircraft threats. The currently deployed ‥lcan Gun has neither the mobility nor the armor protection required to ope‚ ‑e with the forward combat forces. The DIVAD Gun System is being competitive‥ developed by two contractors, both of whom sucessfully designed and built pre ‑roduction prototypes. Tests of both systems have been conducted and although th‑ results have not been officially scored, preliminary indications are that they were highly successful. A single contractor will be selected in 1981 to continue the program into a maturation phase and to prepare for production in FY 1982. The IOC date for DIVAD Gun is 1986. For FY 1982, $30.6 million is requested for RDT&E, and $100.0 million for procurement of 12 systems, initial spares, and ammunition.

(c) Improved Chaparral

Chaparral is currently a clear-day only, self-propelled, short range, infrared, passive homing air defense missile system which provides low altitude air defense to US Army divisions and the Corps rear area. The system was deployed initially in 1969 and is undergoing an upgrade program to enhance its ability to counter the increasing air threat. FY 1982 RDT&E funds of $20.1 million are requested for development of an improved guidance section. Procurement of Forward-Looking Infrared (FLIR) thermal imaging target detection modification kits, replacement rocket motors, minor reliability improvements and initial spares will require $60.9 million in FY 1982.

(d) Stinger

Stinger is a Man-Portable Air Defense missile System (MANPADS) which provides a self-defense capability to company-size units operating in the forward battle area. Stinger counters low altitude, high speed tactical aircraft and helicopter threats. Its ability to engage tarr .s overcomes severe limitations of the currently fielded Redeye Stinger entered production in FY 1978. In FY 1982, $162.6 million is requested for procurement of 2535 missiles and initial spares, and $4.5 million is requested to complete R&D of an improved seeker to counter more severe infrared countermeasures.

5. Mine/Countermine Warfare

a. Strategy

Our objective in mine warfare is to acquire a cost effective mix of mines which presently exist or will soon emerge from development in the U.S., United Kingdom, Federal Republic of Germany, or France. A major goal in this area is to develop and acquire significantly improved antipersonnel and antitank mines and to provide enhanced capability to emplace barriers. Day, night, and all-weather capability is required to disperse mines selectively and rapidly by artillery, ground vehicles, aircraft, and rockets to slow, direct, or canalize enemy forces, and thus, improve the effectiveness of our other anti-armor weapons and tactics.

Countermine warfare is designed to meet the changes in threat technology and increased mobility. The Surface Launched Fuel Air Explosive (SLUFAE) is completing development in FY 1981 after a successful operational test. Initial procurement is planned beginning in FY 1983. The United Kingdom's Giant Viper and the Israeli's Portable Mine Neutralization System (POMINS) are completing developmental tests during FY 1981 with possible procurements to follow in the outyears.

b. Key Program

Family of Scatterable Mines (FASCAM)

We request $80.6 million in FY 1982 to procure the Area Denial Artillery Munition (ADAM), and $58.4 million to procure the Remote Anti-Armor Mine (RAAM) artillery-launched mines. The vehicle dispensed Ground Emplaced Mine Scattering System (GEMSS) mines will require $35.5 million in procurement funds. Development of the GATOR mine and dispenser will be completed to provide an airborne capability for delivering scatterable mines. The Army is developing a modular pack mine system for dispensing scatterable mines in support of ground forces. All of these munitions utilize the basic design of FASCAM with modifications only as required for adaptation to each delivery system.

6. Land Combat Support - Chemical Warfare and Chemical/Biological Defense

a. Strategy

The objectives of the United States Chemical Warfare (CW) program are to deter the use of chemical weapons by other nations and to provide an option to retaliate in kind should deterrence fail. As a signatory to the Geneva Protocol, the U.S. has renounced the first-use of lethal or incapacitating weapons. The major thrusts of our programs have been to improve rapidly the defensive posture of all forces in order to survive a chemical attack and continue military operations in a toxic environment. We continue to conduct bilateral negotiations with the USSR toward an effective, comprehensive and verifiable treaty as a major policy objective. In the interim, since little progress is evident in the last several rounds of negotiations, we have continued research and development on safe binary systems for chemical weapons. Recent reviews by the Army and Air Force staffs and the Defense Science Board have identified this as a critical area.

b. Key Programs

Our R&D efforts are directed principally to programs providing protection for both individuals and equipment and to programs providing increasingly realistic training in the use of presently available protective equipment. All programs are structured to allow rapid procurement of both new and improved items.

The key defensive programs in engineering development include the individual protective mask (XM-30), the Modular Collective Protection Equipment (MCPE) for armored vehicles, the biological detection and warning system. the Remote Sensing Chemical Agent Alarm (XM-21), the Hand-Held Nerve Agent Contamination Monitor, the Chemical Attack Warning and Transmission System (CAWS), the M-8 Chemical Alarm Simulator, and the M-256 Detector Kit Training Simulator. New programs include a rapid decontamination system for vehicles, an interior surface decontamination system, a combat vehicle alarm, a detector kit for chemical agents in water, an advanced decontaminant, a surface contamination monitor, and an air base area detection system. Testing of detectors and collective protective systems for naval applications is also in progress.

Advanced development programs include a prototype aviation respirator system, a simplified collective protection system, a hybrid collective protection for armored vehicles, and the Advanced Chemical Agent Detector and Alarm (ACADA), an automatic liquid agent detector (XM-82), detection and alarms component of the NBC reconnaissance vehicle, and a rapid clothing decontamination system.

Product improvement measures are in progress on the M-12A1 decontamination system, the M-256 personal chemical agent detection kit, and the M-8 and M-43E1 chemical agent alarms. Items in procurement include M-8 automatic alarms, M-17A1 protective masks and modular collective protection equipment. Operations and maintenance funds are being utilized to provide expendable items such as protective over-garments, gloves, boots, aircrew special flight ensembles, and to allow for training and readiness exercises.

Retaliatory programs include engineering development of the Bigeye binary VX aerial bomb, and advanced development of a binary warhead for the Multiple Launched Rocket System (MLRS). Development will be initiated on an 8-inch Intermediate Volatility Agent (IVA) projectile and a Corps Support Weapon System warhead. Our FY 1982 request for these chemical warfare programs total $78.8 million for defensive RDT&E, $14.7 million for retaliatory RDT&E, and $71.1 million for procurement of defensive equipment.

7. Land Combat Service Support

a. Strategy

This mission area includes numerous small programs designed to provide support to our operating forces. These efforts provide the land tactical commander with logistics, maintenance, energy, and medical support. They include tri-Service programs for development of a standardized, fully integrated system to provide enhanced interior and exterior physical security for DoD mission critical resources. Underlying the physical security equipment development programs are the objectives to provide a limited system capability for high priority, permanent installations by FY 1983, with a total system capability for permanent, semi-permanent, and mobile modes of deployment by FY 1987.

FY 1982 RDT&E funding for this area totals $80.7 million of which $24.6 million is for the DoD Physical Security Equipment programs. Procurement request is for $46.4 million.

b. Key Programs

(1) Combat Support Equipment

This program encompasses combat engineer equipment such as the family of bridging and container distribution equipment. It also includes logistics for over-the-shore missions, Petroleum, Oil and Lubricant (POL) distribution systems, combat medical material, tactical rigid wall shelters, and Army development of camouflage, simulation and decoy systems capable of defeating the surveillance threat of visual, thermal, radar, and other sensors.

(2) Tactical Electric Power Source

This program continues to advance the state-of-the-art in power generation for field utilization. Benefits are measured in terms of increased mobility, lowered noise level, reduced heat signature, increased efficiency and reduced fuel consumption.

(3) Physical Security

The Army, as executive agency for interior physical security systems, is pursuing development of a DoD standardized interior system under the Facility Intrusion Detection System (FIDS) program. The Air Force, as executive agency for exterior security systems, is developing a standardized exterior security system under the DoD Base and Installation Security System (BISS) program. Interoperability and interface designs between these two systems are being monitored by a Tri-Service Integration Working Group. Although a totally integrated interior-exterior system capability is not expected until FY 1987, products of both programs will be made available on an incremental basis to satisfy high priority applications as development is completed.

8. Tactical Reconnaissance, Surveillance, and Target Acquisition (RSTA)

a. Strategy

Improvements in the quality and quantity of weapons on the battlefield and the increasing sophistication of operational tactics emphasize the need to detect, localize, and classify enemy presence and to provide large volumes of target data on a timely basis to support target engagements and friendly maneuvers. Tactical Reconnaissance, Surveillance, and Target Acquisition Mission Area programs are structured to provide timely and accurate data to the battlefield commanders engaged with the enemy. These data support the effective utilization of combat resources on a 24-hour a day basis and under adverse weather, countermeasure, and battlefield conditions.

b. Key Programs

(1) Stand-Off Target Acquisition System (SOTAS)

SOTAS is an Army program to develop a heliborne target acquisition system that will provide a capability to detect and locate moving targets during day, night, and under adverse weather conditions. Information will be displayed in near real-time at ground stations with sufficient accuracy for strike by Army and Air Force support weapon systems.

SOTAS is a division-level asset consisting of a heli-borne moving target indicator radar; one primary ground station at the Division Headquarters; five secondary ground stations (one each at division artillery headquarters, Tactical Operations Center (DTOC); and the three maneuver brigade headquarters; and a data link/positioning system. Selected targeting data from SOTAS will be fed to TACFIRE for immediate attack with fire support; and for battle management to the all-source analysis system. The SOTAS program has been in engineering development since 1978. The FY 1982 RDT&E request is $71.7 million. IOC date for SOTAS is projected for FY 1987.

(2) Remotely Piloted Vehicle (RPV)

The RPV system will provide a capability for target acquisition, adjustment of artillery fire, laser target designation, and selected area reconnaissance. This system will extend the "eyes" of brigade and divisional units beyond the "first hill," and allow artillery units to place effective fire on targets hidden from the view of the ground observers. When used with precision guided munitions, targets such as tanks can be attacked as they move towards the battle area.

The initial RPV sensor package will provide a day-only capability and will consist of a gimballed TV and a laser ranger/designator. An interchangeable sensor package with FLIR for night operations is in advanced development.

Developmental design and fabrication efforts are continuing with inital design reviews in progress as FY 1981 begins. System integration and flight tests are to follow later in FY 1981. Engineering development hardware consists of 22 air vehicles, 19 mission payload subsystems, 4 ground control stations, and 3 launcher and recovery subsystems. The FY 1982 RDT&E request is $59.5 million. The expected IOC for the RPV system is FY 1985

(3) Reconnaissance, Surveillance and Target Acquisition Helicopter

This program is aimed at improving the capability and survivability of Army scout helicopters. Also known as the Army Helicopter Improvement Program (AHIP), this program will update Army scout helicopters to include the following equipment: (a) composite rotor blades, (b) a mast-mounted television sight including FLIR and laser designating equipment, (c) nap-of-the-earth communications, and (d) and air-to-air Stinger weapons system. Improved scout helicopters will team with the AH-64 and AH-1S attack helicopters as hunter/killer teams. The small, agile, not-easily-detectable scout will provide the beyond-the-FEBA eyes for more expensive attack assets and laser-designate targets for the Copperhead laser guided artillery round. In FY 1992, $39.3 million is requested to continue RDT&E efforts on this program.

D. AIR WARFARE

1. Introduction

Air Warfare covers the mission areas of Counter Air, Close Air Support/Battlefield Interdiction, Naval Strike/Interdiction, Defense Interdiction and Tactical Trainer Aircraft. These forces are being optimized to meet the primary threat to NATO, but are also being enhanced to improve our ability to employ effectively a world-wide rapid deployment force.

2. Counter Air

a. Strategy

Historically, U.S. and NATO fighter aircraft have had a technological edge on Russian and Warsaw Pact aircraft. However, in recent years the Soviets introduced significantly improved aircraft and at the same time have maintained their numerical superiority. Therefore, we must utilize our technological superiority to achieve high effectiveness and greater availability in our aircr ^t and move toward higher effectiveness at moderate cost in our weapons. Lookdown/shootdown capability is required, and efforts are continuing to improve both our aircraft and missiles in this regard. A capability to close effectively enemy airfields is an important means to reduce the number of enemy sorties, and we are developing and testing ordnance specially designed for this task.

b. Key Programs

(1) F-16 Multimission Fighter

The F-16 was developed as a replacement fighter aircraft for the U.S. and four NATO nations. This aircraft is a single engine, lightweight, highly maneuverable fighter that excels in both air-to-air combat and delivery of air-to-surface weapons. For the U.S., the F-16 will replace aging F-4 aircraft in the Active Forces and some of the older aircraft in the Reserve Forces.

The first deliveries to USAF and European Tactical Air Forces and to a USAF training squadron occurred during 1978. Now armed with a gun and the AIM-9 infra-red missile for air combat, the F-16 will eventually be armed with the Medium Range Air-to-Air Missile (AMRAAM). We are improving the F-16 radar to provide increased detection and tracking range and track-while-scan capability. Development of a Programmable Signal Processor (PSP) is key to these improvements and added resistance to countermeasures. With these improvements, the F-16 will be capable of rapid, successive AMRAAM launches against multiple targets except under extreme jamming conditions. The FY 1982 funding request includes $43.0 million for RDT&E and $1,344.5 million for procurement of 96 aircraft.

(2) F-15 Fighter

The F-15 is designed specifically to gain and maintain air superiority. It is a high performance, highly maneuverable fighter equipped with a long-range lookdown radar and a mix of air-to-air weapons (AIM-7, AIM-9, 20mm gun). It will use AMRAAM when available. Procurement funding of the authorized 729 aircraft will be complete in FY 1983. This force will include F-15C and D models which will incorporate a PSP and other improvements. The F-15 PSP provides greater resistance to electronic countermeasures, higher resolution and the introduction of new air-to-ground radar modes. $24.8 million is requested for FY 1982 RDT&E for on-going program management and support along with procurement of 30 aircraft at a cost of $837.0 million.

(3) Engine Model Derivative Program (EMDP)

Many of our current aircraft systems will be in the active inventory until the year 2000. During this time period, changes in missions and in threats are certain to occur. To ensure that improved propulsion options are available to meet these contingencies and to reduce durability, operability and reliability problems on current in-Service engines, we are continuing to sponsor the demonstration of engine concepts derived from current military qualified engines.

Current and planned Engine Model Derivative Program efforts are focused on shorter term demonstrations to verify that kit-type modifications to existing engines can improve the engines at low risk. In FY 1982, we are continuing efforts on the T56 engine for the C-130 to provide a 10% reduction in specific fuel consumption and 20% improvement in hot day takeoff thrust. The reduction in fuel consumption alone will result in a $30M per year fuel savings for the Air Force C-130 fleet. The demonstration of an F100 Derivative II engine will lead to limited flight testing in FY 1983 to verify a 15% thrust improvement and twice the hot section durability of the current F100 (3) engine. Another program is proving the feasibility of achieving a 17% thrust improvement in the TF34 engine for the A-10. We also plan to demonstrate a 10% reduction in the specific fuel consumption of the TF33 engine (C-141, B-52C/H and C-135). A $66 million yearly fuel savings for the C-141 fleet would result from this effort. The FY 1982 budget request for the Air Force Engine Model Derivative Program is $21.5 million.

(4) Beyond Visual Range (BVR) Missiles

Our current BVR air-to-air missiles are AIM-7 Sparrow and the AIM-54 Phoenix. The Phoenix is a long range missile optimized for fleet air defense. The Navy's F-14 with AWG-9 fire control system can launch multiple Phoenix missiles at multiple targets at ranges of more than 60 miles. The AIM-54A should fulfill this need for several years until the Soviet Union develops more effective electronic countermeasures (ECM). At that time, the AIM-54A inventory can be upgraded by modifying the missiles to the AIM-54C configuration. The AIM-54C, now being developed, should meet the projected ECM threat during the 1980-1990 time period and should provide a capability against Soviet cruise missiles. The AIM-54C will replace analog circuitry with modern digital processing. The AWG-9 will be upgraded with a programmable signal processor to improve the ECCM capability of the weapons system.

The medium range AIM-7M Sparrow is now completing development for both Navy and Air Force use. Using a monopulse seeker, it provides better performance than the AIM-7F in clutter. AIM-7M production began with an increment of the FY 1980 procurement with all production shifting to AIM-7M in FY 1981.

In the joint Air Force/Navy AMRAAM program, we are taking advantage of advanced technology to develop a follow-on radar missile to provide a high engagement rate against multiple targets, improved range, lower susceptibility to ECM, lighter weight and higher speed than AIM-7Ms. Two contractors are now in a competitive validation phase.

Development of AMRAAM and an Advanced Short Range Air-to-Air Missile (ASRAAM) is proceeding as a cooperative NATO program. A Memorandum of Understanding has been negotiated among the U.S., the Federal Republic of Germany, and the United Kingdom, with France participating as an observer. The MOU provides that the U.S. will develop AMRAAM, and our European Allies will develop ASRAAM. The Four Powers have agreed in principle to the required characteristics for both systems. Total funding requested for BVR missiles in FY 1982 is $174.0 million for RDT&E and $437.2 million for procurement of 72 Phoenix and 1,965 Sparrow (Navy and Air Force) missiles.

(5) Within Visual Range (WVR) Missiles

The ASRAAM program is in its very earliest stages, and the missile is not likely to be in our forces until the 1990s. In the meantime, we are producing the AIM-9L Sidewinder. This WVR missile uses a sensitive infrared seeker that permits attack of target aircraft at military power from all aspects. Tests show that having all aspect capability causes drastic changes in the nature of WVR air combat. The Navy and the Air Force have jointly developed the AIM-9M, a product improvement of the AIM-9L, that will provide enhanced background discrimination capability and a capability to track a target that is using certain IRCM. First production of the AIM-9M is planned in FY 1981 with an IOC in FY 1982 pending successful completion of IOT&E. We are requesting $76.8 million for joint Service procurement of 790 Sidewinders.

(6) Combat Aircraft Prototype (CAP)

This new initiative will establish a program to mature technologies through the design and flight test of several air vehicles configured for mission application. There are several benefits to be derived from this program. First, it provides an interim step between the flight vehicles that are configured for advanced technology evaluation; e.g., Advanced Fighter Technology Integration (AFTI), Mission Adaptive Wing, Forward Swept Wing, etc., and the aircraft configured for full scale development; e.g., AV-8B, F-18. This step allows DoD and industry to observe the performance of a mission-oriented air vehicle (as opposed to a research vehicle) which integrates diverse technologies that have proved to be successful on individual technology demonstration aircraft. The net result will be to assess whether these technologies can be successfully scaled for mission application when total weapon system requirements must be considered in a design.

A second benefit will be to focus industry IR&D and government funded research efforts to support future mission needs. A program that initiates a new prototype every two years will provide stability for government planning and industry development. Technology validated on a mission relevant airframe (as opposed to a test airframe) can shorten the time for technology transition from laboratory to full scale development. The current program approach will be to define a critical mission segment--e.g., short take-off at maximum payload--and then let industry propose to integrate various newly demonstrated technologies--e.g., composite materials, high lift devices, etc.--that could be configured for a ground attack aircraft, for example. RDT&E request is for $22.5 million for FY 1982.

3. Close Air Support/Battlefield Interdiction

a. Strategy

Close Air Support and Battlefield Interdiction are particularly important because of the Soviet/Warsaw Pact capability to achieve locally overwhelming force ratios. Fixed wing aircraft provide a highly flexible force, effectively a firepower reserve, that can reach all parts of the theater to draw down enemy forces at or near the front lines. The Soviet Union has placed great emphasis on the ability to move forces quickly and to move and fight at night and in adverse weather. To counter this threat, we must develop systems that achieve a high number of target kills and a high target kill rate. Consequently, we are improving our capabilities for night and adverse weather operation and are developing means to increase the rate at which we can destroy enemy forces with lower cost weapons.

b. Key Programs

(1) 30mm Gun Pod

This program will develop, on an expedited basis, a pod mounted anti-armor gun for use on USAF aircraft. The gun will be a lightweight version of the GAU-8 gun used on the A-10 aircraft. This approach will allow the use of the same ammunition in either the GAU-8 or the 30mm pod. Since this gun pod could be used on F-4E, F-16, A-7, and F-5 as well as be compatible with Navy aircraft, it will provide a near-term anti-armor capability for the Rapid Deployment Force. $12.0 million is requested for RDT&E and $43.0 million for procurement in FY 1982.

(2) Night Attack Program

The Night Attack program has explored sensor and display technology to permit aircrews to do navigation, target acquisition, and weapon delivery at low altitude at night. Several technologies have now been developed to the point where we expect to be able to develop a highly effective night attack capability for single seat aircraft. The Night Attack program will implement the concept of Low Altitude Navigation and Targeting Infrared Night System (LANTIRN) by using an early brassboard model. The FY 1982 RDT&E request for $80.5 million will principally support development of the brassboard demonstrator for flight test validation of the concept.

(3) MAVERICK

Maverick is an air-to-surface missile designed to destroy enemy armor or other small, hard tactical targets. A family of guidance seekers has been developed for Maverick. A television guided weapon, already deployed with the tactical air forces, is no longer in production. An Imaging Infrared (IIR) seeker started full scale development in 1978 for the Air Force. Helicopter captive flight tests have been conducted to validate the IIR seeker algorithms. These improved algorithms will provide better lock-on capability than the digital centroid tracker tested in Europe during 1978. To assure thorough testing prior to a production decision, budgeting of initial procurement funds was deferred to FY 1982. The Navy has chosen a slightly modified IIR Maverick with a larger warhead to fill its at-sea IR attack weapon requirement. The Marine Corps has a requirement for a laser guided Maverick and will complete operational evaluation of this weapon in FY 1981. Funding requested for the Navy and Air Force IIR Maverick program in FY 1982 is $14.9 million for continued engineering development and $200.0 million for procurement of 490 missiles. In addition, $5.1 million is requested for laser Maverick long lead procurement.

(4) Air-Launched Assault Breaker and Corps Support Weapon System

Assault Breaker is a joint DARPA, Army, Air Force feasibility demonstration program. The system employs surface-to-surface and air-to-surface missiles targeted and guided by an airborne radar called PAVE MOVER. The feasibility demonstration phase is scheduled to be completed in FY 1982. After the system concept is demonstrated, the Army and Air Force will consider engineering development of a weapon system. The Army program, the Corps Support Weapon System (CSWS), was discussed in Section B.2. Progress to date includes captive flight testing and selection of a terminally guided submunition sensor and dispenser design for the free flight phase. The Assault Breaker technology demonstration will provide a baseline for the Army CSWS and for the Army Multiple Launch Rocket System terminally guided warhead. We are requesting $20.0 million in FY 1982 to complete the feasibility demonstration of the Assault Breaker concept, including the PAVE MOVER radar, the missiles and the guided submunitions.

(5) Advanced Attack Weapons

We have begun the development of a family of area munition, dispensers, warheads, and guidance systems in the Advanced Attack Weapons program. The Wide Area Anti-Armor Munitions (WAAM) program will provide a system capable of multiple kills of armor targets on a single aircraft pass, even at night and in adverse weather. The four munitions on a single concept originally in development have been reduced to three: the Anti-Armor Cluster Munition (ACM), the Extended Range Anti-Tank Mine (ERAM), and the WASP Mini-Missile. Full scale development of ACM was approved in the first quarter of FY 1981. ERAM and WASP are in advanced development. The Army and Air Force have been coordinating WASP and Hellfire developments to ensure that, wherever possible, common systems or subsystems are used to meet both Air Force and Army anti-armor requirements. An Executive Committee, chaired by the USDR&E, provides strong central management of DoD's Terminally Guided Submunition (TGSM) programs. The committee reviews these programs to improve management efficiency, eliminate unwarranted duplication, and insure that an appropriate degree of competition is maintained. Funding requested in FY 1982 for WAAM advanced development and testing is $56.7 million. Engineering development funding for ACM is $22.2 million and $1.0 million for ERAM.

(6) <u>AV-8B HARRIER</u>

The Marine Corps plans to replace its AV-8A and A-4M light attack force with the Vertical/Short Take-off and Landing (V/STOL) AV-8B. The AV-8B is a dramatic step forward over its V/STOL predecessor, the AV-8A. It features a non-metal composite fiber wing, high lift STOL devices and a 50% internal fuel capacity increase over the AV-8A. It has greater range and payload than either the AV-8A or the A-4M and includes a new landing gear configuration permitting it to operate from rural roads in its optimal short take-off, rolling vertical landing mode. While it is designed primarily to provide rapid-response close air support for Marine Infantry Forces, it also has a limited air defense capability using AIM-9L all-aspect Sidewinder missiles. Battlefield survivability is enhanced through its exceptional maneuverability, inclusion of the passive Angle Rate Bombing System (ARBS) and state-of-the-art Defensive Electronic Countermeasure (DECM) equipment. The unrefueled ferry range of the AV-8B will be in excess of 2400 nautical miles. Combined with its capability to operate from ships, roads or partially-destroyed airfields, this feature will make the AV-8B our most deployable TACAIR asset. In FY 1982, $231 million RDT&E funding is requested to continue development of this aircraft and $670 million is requested for production of the initial 12 aircraft and to procure long-lead items for an additional 24 AV-9Bs.

4. Interdiction/Naval Strike

a. Strategy

Our potential enemies are continuously improving the quality and increasing the number of air defenses. This makes interdiction/Naval Strike increasingly difficult and expensive. Our strategy is to provide systems to degrade the defenses (see Defense Suppression) and precision guided weapons (so that few sorties are required to destroy the targets) or standoff weapons (to avoid the defenses). We are also developing the advanced F/A-18 aircraft that will ultimately replace several less capable types of Navy and Marine aircraft.

b. Key Programs

(1) Tomahawk Land Attack Missile/Conventional (TLAM/C)

We are pressing ahead with full scale engineering development of the Tomahawk conventionally armed land attack cruise missile. The TLAM/C will be used on nuclear attack submarines. The high accuracy demonstrated thus far using optical scene matching area correlation technology for terminal guidance makes a conventional munitions warhead attractive against fixed land targets. Operational objectives for this variant, which will be deployed on nuclear attack submarines and surface combatants, are to provide naval forces with a long range cruise missile capability to attack and neutralize enemy facilities and degrade defense capabilities with conventional munitions.

(2) Medium Range Air-to-Surface Missile (MRASM)

The MRASM provides the Navy and the Air Force with a moderate cost, survivable weapon for use against high value targets. This weapon is an adaptation of the Tomahawk AGM/BGM-109 cruise missile. The modular construction inherent in the Tomahawk allows cost effective integration in a single airframe of the subsystems needed to accomplish both Navy and Air Force missions. Common subsystems include turbojet propulsion, terrain contour matching for enroute navigation, and optical scene correlation for terminal guidance. An on-going Air Force program, the Midcourse Guidance Demonstration Program will provide low cost versions of these common subsystems for later incorporation. The Navy MRASM is 192 inches long with a unitary warhead for use against high value land targets, while the Air Force MRASM is 230 inches long with a runway cratering submunition warhead for attacking airfields. The first missile delivered will be the Navy's AGM-109C, with an IOC of FY 1983. To achieve this early IOC, current Tomahawk subsystems will be used to the greatest extent possible. The AGM-109C will be followed in FY 1985 by the AGM-109J, which is the same as the "C" except that low cost guidance subsystems will be used. The Air Force MRASM is the AGM-109H and will be introduced in FY 1985. Part of the FY 1982 Navy funding will be used to adapt the Maverick Imaging Infrared (IIR) seeker for Harpoon. This action offsets the deferment of the IIR MRASM (AGM-109I), which was necessitated by funding constraints. The FY 1982 funding request for the total MRASM program is $63.3 million, of which $30.7 million is Air Force and $38.6 million is Navy.

(3) GBU-15 Glide Bomb

The GBU-15 project was established to provide a capability to conduct effective attacks against high value fixed land targets. The Air Force successfully integrated and tested the Naval Avionics Command weapon data link on the Cruciform Wing Weapon (CWW) during FY 1980 as directed by Congress. After these tests, the Secretary of Defense reaffirmed the GBU-15 CWW as ready for production and Congressional approval was obtained to reprogram remaining FY 1979 RDT&E funds to initiate production. In FY 1982, we will continue our efforts to integrate the Maverick imaging infrared seeker into the CWW. These efforts will provide the GBU-15 CWW with night and adverse weather attack capability. RDT&E funding requested in FY 1982 for GBU-15 CWW-IIR-Data Link development is $9.8 million. In addition, we are also requesting $51.2 million in FY 1982 for GBU-15 CWW-TV-Data Link production.

(4) F/A-18 Naval Fighter/Attack Aircraft

The F/A-18 is a twin engine, single-seat, multi-mission tactical aircraft which will replace the F-4 in the Navy and Marine Corps fighter community and the A-7 in the Navy attack forces. In the fighter role, its primary mission is fighter escort with a secondary mission of fleet air defense where it will complement the F-14 aircraft. It will carry a balanced mix of AIM-7s (AMRAAM when developed), AIM-9s and a 20mm gun. In the attack role, it will be capable of accurately delivering all guided and unguided air-to-surface weapons.

Full scale development flight test is proceeding four months behind schedule. A DSARC Program Review was held in November 1980. The FY 1982 budget request for RDT&E is $151.4 million and $1,969.4 million for procurement of 58 aircraft.

5. Defense Suppression

a. Strategy

The primary threat to aircraft engaged in tactical air operations is an integrated network of sea and land-based, radar-directed Air Defense Artillery (ADA), Surface-to-Air Missiles (SAMs), and interceptors. The Warsaw Pact has numerous types of highly mobile, widely distributed, and overlapping SAM systems. They operate in close cooperation with early warning radars and threaten the survival and reduce the effectiveness of our tactical air forces. At sea, tactical operations face similar ship-based, radar-controlled air defense systems, which may be grouped in supportive formations and integrated with land-based elements. To achieve effective defense suppression, we are pursuing an aggressive program leading to an appropriate mix of lethal and non-lethal systems.

b. Key Programs

(1) High Speed Anti-Radiation Missile (HARM)

HARM is an air-launched guided missile which can suppress or destroy the radars of enemy surface-to-air missile systems and air defense artillery and radars used for early warning and ground control of interceptors. HARM is able to attack radars which are beyond the capability of either SHRIKE or Standard Anti-Radiation Missiles. It is a joint U.S. Navy/Air Force program intended to be used with the A-7, F/A-18, and F-4G Wild Weasel aircraft. Development testing is complete, and of the 18 firings to date 13 have been successful. For technical and budgetary reasons, the planned procurement of 80 pilot production missiles for early Navy IOC was delayed. We are proceeding with limited production in FY 1981, and the Department has so certified to Congress.

(2) Self-Protect Weapon

Air Force and contractor studies show that a marked reduction in attack aircraft attrition could be realized by equipping attack aircraft with relatively low cost, limited performance self-protection weapons (e.g., an anti-radiation seeker on a Sidewinder air-frame) designed to counter the primary Soviet battlefield air defense systems. We are working closely with the Air Force and the Army to harmonize their requirements and formulate a joint program plan. RDT&E funding of $8.0 million is requested to initiate a program in FY 1982.

6. Air Warfare Trainer Aircraft

a. Strategy

Although the Navy requirement is more critical than the Air Force, both Services will experience shortfalls in trainer aircraft unless steps are taken soon to provide for replacements of their aging trainer aircraft. The Services are working together to define their needs so that both the primary trainer (first needed by the Air Force) and the advanced trainer (first needed by the Navy) can ultimately be used by both Services.

b. Key Programs

(1) Naval Undergraduate Jet Flight Training System (VTXTS)

The VTXTS will replace the Navy advanced pilot training aircraft which are becoming obsolescent. The training provided by this system will consist of actual flight, simulated flight, and academics. The MENS was approved in 1979. Detailed studies, with industry participation, will investigate new systems and off-the-shelf alternatives in preparation for DSARC I/II. Funding of $12.6 million for RDT&E is requested to initiate full scale engineering development leading to an IOC in the 1987-89 period. The earlier date is possible if the Navy chooses to adopt an existing airframe. The latter date reflects the choice of a new aircraft design.

(2) Air Force Next Generation Trainer (NGT)

The T-37 primary flight trainer, which is approaching the end of its service life, will be modified or replaced. Air Force experience indicates that the preferred trainer would be a twin-engine, two-seat (side-by-side) airplane with modern wing technology; however, the existing T-34C will be evaluated to determine training effectiveness and cost relative to an airplane of a new design. Contractor concept exploration studies were completed in CY 1980 and a Request for Proposals will be issued in CY 1981. We are requesting $15.0 million in FY 1982 to award a contract and begin development of the airframe and engines, if required. An IOC of 1987 is required.

E. NAVAL WARFARE

1. Introduction

Naval Warfare programs are oriented toward maintenance and improvement of capabilities essential to free use of the seas. Principal needs in Naval Warfare are to:

- o Protect the sea lines of communication linking us to the territory of allies threatened by external aggression.
- o Protect merchant ships carrying US foreign trade and support our allies in protecting their own trade.
- o Protect our own territory and to assist our allies in protecting their territory from attack by hostile maritime forces.
- o Protect our maritime strategic deterrent forces.

Naval Warfare forces include not only those which defend shipping against direct threats, but those sea-based air and amphibious assault forces which can strike at threats before they can reach the sea lanes.

2. Anti-Air Warfare (AAW)

a. Strategy

Defense of the surface fleet against air attack is based upon the defense-in-depth concept. Under this concept, the attacking aircraft and anti-ship missiles will first be engaged at longer ranges by fighter aircraft and long-range area defense SAMs. These weapons systems will reduce the number of attackers to a level which can be countered successfully by the ship's shorter range self-defense systems. Current programs are directed primarily toward improving the range and effectiveness of shipboard combat systems and providing more integrated ship AAW systems for the future fleet.

b. Key Programs

(1) Aegis and CSEDS

Aegis is an integrated AAW system designed for fast reaction, high tracking and engagement capacity, and improved missile guidance. Design modifications for the Aegis system, based on the experience gained from sea trials, will be tested at the land-based Combat Systems Engineering Development Site (CSEDS). The initial installation of Aegis will be on the CG-47 in 1981 with 16 systems currently planned for procurement in the 1982-1986 time frame. For FY 1982, RDT&E funding of $10.7 million supports Aegis developmental testing on the NORTON SOUND and $17.0 million is for the integration and testing of the ship's tactical computer at the CSED site. Procurement funding of $2,116 million is requested in FY 1982 for two CG-47 class, Aegis cruisers.

(2) Standard Missiles

The Aegis weapon system, as well as our existing area AAW weapon systems use the Standard Missile (SM). An improved propulsion system will be incorporated into the current Standard Missile (SM-1). A follow-on medium range missile, the SM-2(MR), will be used for Aegis and will incorporate many additional features to increase the weapon system effectiveness. The IOC of the extended range SM-2(ER) was in 1979. The New Threat Upgrade program will give the CG 36/38, CG 16/26, and DDG-993 classes of ships the capability to fire the SM-2(MR) missiles. The baseline CG/SM-2 program has successfully completed OPEVAL. Current plans call for upgrading all these ships by 1991. The VLS system, for the vertical launching of the Standard Missile, is in development and is planned for the CG-47 class ships. VLS promises to reduce costs, decrease reaction time, and increase the flexibility of the weapons loadout. In FY 1982, funding requested is $20.0 million in RDT&E to improve and test the SM-2 missile, produce the SM-1 missile modifications for operational evaluation, and develop a vertical launcher; and $452.0 million in procurement to buy SM-1 (MR), SM-2 (MR), and SM-2(ER) missiles.

(3) Self-Defense Weapons Systems

The short range air defense requirements for surface ships will be met by the Phalanx Close-In Weapon System (CIWS) and the NATO SEASPARROW Improved Point Defense (IPD) missile system. CIWS entered the fleet operationally in 1980, and is a high-rate-of-fire 20mm gun with a self-contained closed-loop search and track radar mounted in a single above-deck structure. The Improved Point Defense system will use the NATO SEASPARROW monopulse missile with an IOC of FY 1982. The PHALANX systems will be installed on 290 combatants and auxiliaries of various classes. In FY 1982, RDT&E funding of $1.4 million is requested for the improved Block I systems and $138.2 million in weapons procurement to buy 50 PHALANX units.

A cooperative effort with the Federal Republic of Germany and Denmark is underway to develop the Rolling Airframe Missile (RAM), a lightweight, low cost, ship defense missile system as either a stand alone point defense system or as a complement to NATO SEASPARROW. In FY 1981, $15.5 million was funded for the US portion of the engineering development costs. In FY 1982, $20.5 million has been requested to continue this effort. The initial fleet availability date is FY 1986.

(4) Self-Defense Electronic Warfare

As a complement to hard-kill AAW weapons in the future, the fleet will place increasing emphasis on "soft-kill" or Electronic Warfare (EW) means to decoy or confuse enemy missiles. Crosseye, an active EW system, will continue to be emphasized. A high-angle threat capability will be developed for the SLQ-17/32 shipboard EW suites. In FY 1982, efforts will continue to develop systems. In FY 1982, a total of $50.1 million has been requested in RDT&E and $30.0 million in procurement.

(5) Shipboard Surveillance Radars

Improvement of the shipboard radars in support of Fleet Air Defense will continue in two broad areas--upgrading near term fleet radar capability and developing future radars. Improvements to existing radars will emphasize automatic target detection and tracking techniques plus improved reliability and maintainability.

(6) Command and Control

The defense-in-depth concept requires effective coordination of sensors and weapons on both ship and air platforms. Electronic jamming of communication links, as well as surveillance and fire control radars, is expected to pose a significant threat to the effectiveness of our AAW systems. The Navy is participating with the other Services in developing systems to counter this threat. The Joint Tactical Information Distribution System (JTIDS) which will enter the fleet in the mid 1980s is expected to provide for more secure communications. These developments are discussed in the section on Theater and Tactical C^3I. Efforts to improve the electronic countermeasures resistance of our shipboard and airborne radars are continuing.

3. Ocean Surveillance and Anti-Surface Ship Warfare (ASUW)

a. Strategy

The goal of Ocean Surveillance and Targeting programs is to provide timely and accurate surveillance data to naval tactical commanders and the National Command Authorities in a form suitable for tactical exploitation. Work is continuing to improve our capability for targeting. Anti-Surface Warfare uses the surveillance and targeting information to destroy or neutralize detected targets, whether they are enemy surface combatants or merchant ships. Tomahawk continues as a major effort in FY 1982.

b. Key Programs

(1) Over-The-Horizon (OTH) Targeting

Initial demonstrations focused on the use of the Outlaw Shark system to provide a correlated, computer-formatted, all-source data handling capability for the forces at sea. Outlaw Shark data are then correlated with on-board sensor data to support target identification and targeting requirements. The long range plan is to integrate an Outlaw Shark-like capability into existing shipboard hardware, starting with the MK-117 Fire Control System aboard nuclear attack submarines and continuing with the Common Weapon Control System aboard Tomahawk capable surface ships. In FY 1981 all OTH efforts are being centrally managed within the Navy's command and control structure. Funding of $20.1 million in RDT&E is requested to support the basic development effort which will result in the introduction of a data handling capability for over-the-horizon targeting information in support of the Tomahawk IOC during FY 1982 for the subsurface launch mode and during FY 1983 for the surface launch mode.

(2) Tomahawk Anti-Ship Missile

The Tomahawk Anti-Ship Missile (TASM) is a 250 nmi offensive weapon capable of deployment from either submarines or surface ships and will overcome the current Soviet anti-ship cruise missile stand-off range advantage. The land attack versions of Tomahawk (TLAM/C and TLAM/N) are discussed in previous chapters, as was the ground launched system using the Tomahawk missile (GLCM).

TASM will be capable of being launched from nuclear attack submarines, cruisers, and Spruance class destroyers (DD-963 class). The submarine launched TASM will achieve IOC during FY 1982. The surface ship launched version of TASM will continue development with OT&E scheduled during 1982 in support of an FY 1983 IOC. In FY 1982 we will procure 24 TASMs.

(3) Penguin

Penguin is a Norwegian, inertially guided, passive infrared terminal homing, 16 nmi anti-shipping missile. The US is conducting a joint evaluation of the MK-2 Penguin with the Royal Norwegian Navy. The MK-2 includes an improved seeker and a dog-leg trajectory capability. In FY 1982, $3.9 million is requested to continue the joint test and evaluation program begun in FY 1980.

(4) Surface Gunnery

Work in this area will continue on the 5-inch guided projectile program and with improved sensors to support surface gunnery. In FY 1982, RDT&E funding of $6.2 million is requested for the fabrication, testing and integration of 5-inch semi-active laser guided projectiles and $7.8 million is requested to procure 5"/54 and 76 mm ammunition.

4. Undersea Surveillance and Anti-Submarine Warfare (ASW)

a. Strategy

Undersea surveillance provides information on the types and locations of potentially hostile submarines, early warning of surge deployments of hostile submarines, and technical information on Soviet submarines. ASW protects US forces so that they can perform their missions and assures that sea transport suffers minimal losses from submarine attack.

Surveillance developments in FY 1982 will continue to emphasize rapid detection and localization of threats for tactical ASW commanders through the implementation of an Integrated Undersea Surveillance System (IUSS).

ASW efforts during FY 1982 will continue to be directed toward development of in-depth area, barrier, and local defense capabilities that will complement our undersea surveillance and command and control systems.

b. Key Programs

(1) Surveillance Towed Array Sensor System (SURTASS)

SURTASS successfully completed OPEVAL and a contract was awarded for procurement of the first three ships. In FY 1982 we are requesting $16.5 million for procurement of system electronics and $152.0 million for four T-AGOS ships.

(2) Tactical Towed Array Sonar (TACTAS)

The purpose of the AN/SQR-19/TACTAS program is to provide the next generation of surface ship towed array sonar with improved detection, classification, and tracking capabilities. SQR-19 will replace the SQR-18. The FY 1981 effort is focused on completion of engineering development, including software and shipboard electronics development, and conclusion of final factory tests. During 1981 full-up shipboard installation of a complete prototype system for TECHEVAL and OPEVAL will be initiated.

In FY 1982, funding of $17.0 million is requested to complete the prototype system shipboard installation and at-sea performance testing. DSARC III and approval for surface use are scheduled.

(3) Light Airborne Multi-Purpose System (LAMPS MK III)

The LAMPS MK III is optimized for the reaction ASW mission, to prosecute contacts generated by the shipboard long-range sensors. Anti-ship surveillance and targeting is a secondary mission. The MK III (SH-60B) will be introduced into the fleet and will initially replace the MK I aboard DD-963 and FFG-7 class ships. The MK III will provide an extended range/on-station capability over the MK I by incorporation of a more efficient, advanced acoustic processor, a longer range radar, and improved ESM. During FY 1980, development, test, and evaluation of five prototype air systems and three ship systems was initiated resulting in numerous successful flight tests. The FY 1981 program will complete Navy preliminary evaluation and commence OPEVAL, moving the MK III project to a DSARC IIIA Milestone by late FY 1981 for consideration of pilot production. For FY 1982 $13.6 million is requested for completion of RDT&E including OPEVAL. In FY 1982, 8 LAMPS MK III systems will be procured at a requested procurement funding level of $503.4 million. We are also requesting $133.4 million for long lead-time procurement.

(4) MK 48 Advanced Capability (ADCAP) Torpedo

In order to counter effectively the threat projected for the 1980s and beyond, the MK 48 will be given improved acoustic performance, better counter-countermeasures effectiveness, increased warhead stand-off distance, and a close-in attack capability. FY 1982 funding of $43.8 million in RDT&E is requested to complete in-water test and evaluation.

(5) Advanced Lightweight Torpedo (ALWT)

The ALWT is an air and surface launched weapon that will replace the MK 46 NEARTIP. The ALWT will operate against a deeper, faster, possibly quieter submarine threat employing sophisticated countermeasures. In FY 1982, $83.7 million in RDT&E is requested to complete in-water testing of advanced development prototype torpedoes.

(6) Attack Submarines

Submarine alternative studies are continuing to examine SSN new construction options which would be available about FY 1983. The SSN chosen will be a follow-on to the SSN-688 class. Further studies and R&D are on-going to determine technology that holds promise, in the 1990s, for a capable attack submarine that we can afford to build in the numbers required to maintain desired force levels. Advanced design diesel powered submarines are also being examined to see if they would be more cost effective for certain missions. FY 1982 funding of $75.2 million for RDT&E is requested to pursue these studies and development efforts.

(7) P-3 Modernization

Modernization of our P-3 Land-Based Maritime Patrol aircraft force through qualitative upgrades remains a major ASW goal. This program will add improvements to the P-3 communications suite, Electronic Support Measures (ESM), and ASW localization and acoustic subsystems. During FY 1981 the hardware and software development and integration program commenced. In FY 1982 $22.5 million is requested for RDT&E to continue systems integration including preparation for operational and systems test and evaluation. Approval for Service Use (ASU) is presently planned for 1983.

(8) S-3 Weapon System Improvement Program

In this program the weapon systems of the S-3 carrier-based ASW aircraft are being upgraded to increase its tactical effectiveness against the present and projected threats. The present acoustic signal processor will be replaced with a version of the standard Advanced Signal Processor. This is the same processor that is used in other modern ASW systems (e.g., P-3C Update III, LAMPS MK III, TACTAS SQR-19). It will improve substantially the S-3's capability to detect and classify modern Soviet submarines. The radar subsystem will be augmented which will permit the S-3 to detect and classify surface ships. For FY 1982 $44.8 million of RDT&E funds are requested for system development and detailed integration.

5. Mine Warfare and Mine Countermeasures

a. Strategy

The naval mine can be a highly cost effective weapon. The Soviets have long recognized the utility of mines and have developed large stockpiles which include new types capable of providing a threat in deep ocean areas and the means for fast delivery of a large number of mines. Our mine warfare program is closely coordinated with our NATO allies to achieve the Long Term Defense (LTDP) objective.

The major thrust of our naval mine program is to develop a family of mines consistent with the NATO Long Term Defense Plan.

b. Key Programs

(1) CAPTOR Mine

In late 1980, the CAPTOR program was terminated as a result of its poor test performance. The Navy subsequently made and tested modifications to improve this performance. The results were successful. The program and test results were reviewed in detail, and procurement of CAPTOR was reinstated.

(2) Quickstrike

Quickstrike is a family of shallow water bottom mines based primarily on conversion of existing ordnance (bombs and torpedoes). An exception is the 2000 lb. Quickstrike MK 65 mine which is not a conversion of an existing bomb. It has a thinner case than the equivalent bomb and contains the most effective underwater PBX explosive. In FY 1982, a procurement of 307 out of the total inventory objective of mines is planned. The Target Detection Device, TDD-57, employing influence mechanisms, will convert MK 80 series bombs to mines. Procurement of an additional 1701 TDD-57s is planned in 1982. The TDD-58 combination sensor for the MK 65 mine will complete development in FY 1982, and enter production in FY 1983.

In RDT&E, the conversion of the MK 37 torpedo into the Sub-Launched Mobile Mine (SLMM) will commence procurement in FY 1982 with 128 units. SLMM will provide the fleet with a covert stand-off mining capability.

The requested FY 1982 funding for Quickstrike is $7.2 million in RDT&E and $38.7 million in procurement.

(3) Mine Countermeasures (MCM) Ship

The first of a new class of mine countermeasure ships is to be procured in FY 1982 with a total of 15 programmed for the

FY 1982-1986 time frame. The MCM is to be a 1000 ton vessel with deep ocean mine locating and destruction capabilities. To meet this requirement the ship will be equipped with the latest mine hunting and countermeasure equipment. In FY 1982, $22.2 million is requested for the development of this ship's equipment and $100.6 million for procurement.

6. Multimission Naval Systems

a. Strategy

This mission area includes weapon systems and their subcomponents that are capable of performing multiple missions or being employed in ships or aircraft that are designated for one or more missions, e.g., V/STOL, LCAC, DDGX, etc. $620 million is requested in FY 1982 for ship and aircraft design and to pursue a variety of ship and aircraft improvements, e.g., ship data multiplex system, increased survivability, improved nuclear and non-nuclear propulsion systems, etc. Some of these improvements will be incorporated in ship and aircraft designs over the next five years.

b. Key Programs

(1) V/STOL

This program maintains the technology base for V/STOL aerodynamics and propulsion related technologies. Within this program the Navy will conduct piloted flight simulations to investigate the flight dynamics of new aerodynamic concepts and develop/test STOL and V/STOL unique propulsion systems. The RDT&E request in FY 1982 is $15.0 million.

(2) Air Cushion Landing Craft (LCAC)

The LCAC, with their high speed and their ability to land heavy equipment and personnel beyond the surf line, will provide the

Marines a significant tactical advantage over current landing craft. They will allow amphibious force ships to launch assaults greater distances from the beach and will permit amphibious landings over steep gradient and very shallow gradient beaches denied to current landing craft. Development of the LCAC will continue with $5.3 million requested in FY 1982. Production is scheduled to start in 1982 with three LCAC requested for $76.1 million. A total buy of 24 craft is currently planned.

F. Mobility

1. Introduction

Mobility forces should enable us to deploy our general purpose forces rapidly to overseas theaters, to increase their flexibility when deployed, to provide for their logistic support, and to resupply our allies. Significant improvements are planned in this area with emphasis on strategic mobility for the Rapid Deployment Force.

2. Air Mobility

a. Strategy

The primary purpose of air mobility in the form of fixed wing transports and helicopters is to deploy rapidly and sustain manpower, firepower, and supplies. Air mobility assets are used to airlift those combat elements which would not be responsive if moved by land or sea transport. Thus, the airlift force must be balanced to ensure an appropriate mix of long range, short range, and vertical lift assets. This force is being optimized to meet our needs to deploy and sustain elements of a worldwide responsive rapid deployment force. Air mobility must also be capable of meeting the time-sensitive requirements associated with a simultaneous NATO/Warsaw Pact conflict and a non-NATO contingency.

b. Key Programs

(1) Fixed Wing Aircraft Programs

(a) C-X

The C-X aircraft will have the capability to airlift, over intercontinental ranges, large military equipment which currently can only be carried on the C-5 aircraft. Specific characteristics will be determined on the basis of requirements derived from an evaluation of representative world-wide scenarios (geographic locations and conditions). The expression of requirements for the C-X in terms of broad mission statements along with performance goals, provides proposing contractors maximum freedom in C-X design. In addition, we are evaluating, through separate action, the capabilities of existing and derivatives of existing aircraft to meet our requirements. The above actions will result in a decision as to whether to buy a new aircraft, an existing aircraft, or a mix thereof. We are requesting $229.0 million in FY 1982 for full scale development.

(b) C-5A Wing Modifications

The fatigue life of the C-5A wing has proved inadequate to meet the required aircraft flight lift of 30,000 hours. The C-5A is currently our only asset capable of carrying many items of outsize military cargo. Its payload capacity is vital to rapid deployment and NATO reinforcement. To ensure that these aircraft have sufficient flight life to perform their mission through the 1990s, modification and strengthening of the wing are required. This program is well under way. For FY 1982, $15.9 million is requested to continue development efforts and $214.6 million is requested for kit fabrication of 18 kits plus installation of 5 modification kits.

(c) Civil Reserve Air Fleet (CRAF) Enhancement

The CRAF program is designed to augment military airlift assets with wide-body commercial passenger airlift. These aircraft would be used in times of national emergency to augment our existing airlift fleet. As an incentive, the commercial carriers will be reimbursed, not only for the cost of the modification, but also for their added of representative world-wide scenarios (geographic locations and conditions). The expression of requirements for the C-X in terms of broad mission statements along with performance goals, provides proposing contractors maximum freedom in C-X design. In addition, we are evaluating, through separate action, the capabilities of existing and derivatives of existing aircraft to meet our requirements. The above actions will result in a decision as to whether to buy a new aircraft, an existing aircraft, or a mix thereof. We are requesting $229.0 million in FY 1982 for full scale development.

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(d) C-141B

The C-141B stretch modification program provides about 30% increase in cargo capacity and an air refueling capability for each aircraft modified with no significant increase in operating costs. $52.9 million is requested in FY 1982 to finish this program, thus providing a completely modified force of 269 aircraft.

(2) Vertical Lift Programs

(a) Blackhawk

The UH-60A Blackhawk aircraft is the Army replacement for Vietnam era UH-1 light troop and litter carrying helicopters. The UH-60A design emphasis on reliability and maintainability has already proven its worth in operational service with the Army. Aircraft ready rates in excess of 90% are not uncommon in Blackhawk units. In FY 1982, $409.3 million is requested for procurement of 78 Blackhawk aircraft.

(b) CH-47D

This program is aimed at improving reliability, maintainability, performance, and safety, while extending the life of the Army's medium-lift CH-47 helicopters an additional 20 years. The present CH-47 fleet of A, B, and C airframes will be overhauled and the following new systems incorporated: (a) fiberglass rotor blades, (b) transmission and drive system, (c) modularized hydraulic system, (d) auxiliary power unit, (e) electrical system, (f) advanced flight control system, and (g) multi-hook-external cargo suspension system. In FY 1982, the second year of production, $182.5 million is requested for updating of 12 aircraft and to procure long lead items for an additional 24 aircraft.

3. Sea Mobility

a. Strategy

Forces for the defense of the sea lanes are sized to engage in a worldwide war at sea with the Soviet Union concurrent with a non-NATO contingency since the situation would pose the greatest threat to the sea lanes and cause the maximum flow of essential shipping. A wartime objective of sea lane defense forces is to ensure the delivery of seaborne material to the U.S. and its allies with an acceptable loss rate. Also, to ensure fast response for emerging situations, there is a need to forward deploy military equipment to support a Marine Amphibious Force (MAF).

b. Key Programs

(1) Maritime Prepositioning Ships

We planned to procure eight multipurpose mobility ships (T-AKX) in the Five-Year Defense Plan and to convert four existing roll on/roll off ships. These ships will be used to forward deploy equipment for one Marine Amphibious Brigade by 1983; a second by 1985; and a third by 1987. The T-AKX is a modified version of the Maritime Administration PD-214 design, the "Security" class ship. Other alternatives of leasing and/or converting existing commercial ships are being investigated as a means of providing a near-term capability while the "Security" class ships are under construction. The FY 1982 funding requested is $336 million.

(2) Fast Deployment Ships

We plan to convert two of eight containerships to a roll on/roll off configuration in FY 1982. We assume that these ships will be acquired with $285.0 million of Maritime Prepositioning Ship and SL-7 Cargo Ship Program funds appropriated in FY 1981. The remaining six containerships will be converted in FY 1983 and 1984. Plans for maintaining these ships in a ready status are being prepared. The FY 1982 funding requested in $216 million.

G. THEATER AND TACTICAL C^3I

1. Introduction

Command and Control, Communications, and Intelligence (C^3I) systems support day-to-day operations, rapid assessment of indications and warning information for decision makers in periods of tension and impending conflict, accurate situation monitoring and allocation of resources in crisis situations, and the conduct of military operations in wartime. They provide timely and unambigious assessment of the tactical situation; means to coordinate allocations of firepower, surveillance, mobility; and logistics resources for accomplishment of mission objectives; and interoperable, secure, and survivable communications. We are actively supporting programs to improve our ability to control our forces under mobile situations, provide our commanders with faster and more reliable intelligence information, enhance the survivability and restorability of our command and control systems and insure the interoperability of our communication systems with our allies. The programs described below provide detailed information on the specific areas under development or acquisition.

2. Theater Command and Control

a. Strategy

Our theater Command-and-Control (C^2) programs emphasize

- achievement of force management capabilities world-wide, including C^2 means which are deployable to areas where we do not have permanent facilities
- survivability and restorability of essential C^2 functions in key areas
- capability to participate in multi-national defense efforts, support alliance commitments, and manage joint-Service land, sea and air operations efficiently and effectively.

b. Key Programs

(1) Joint Crisis Management Capability (JCMC)

The JCMC program will provide CINCEUR, CINCPAC and CINCRED a highly mobile C^3 capability for use in crisis management situations and military contingency operations.

The JCMC program is being implemented to achieve four levels of capability:

Level 1 is a minimum essential, highly transportable, communications package which includes a small satellite terminal designed to provide secure communications from the scene of a small crisis to the National Command Authority (NCA). We expect to achieve an interim capablity in FY 1982 and a full capability in FY 1984.

Level 2 is a rapidly responsive airborne C^3 capability to collect information and relay it from the crisis scene to the NCA. It is being implemented in conjunction with the Level 3 capability.

Level 3 is an air and ground transportable C^3 capability to support a moderate size joint force while it is either airborne or on the ground. Levels 2 and 3 are being implemented under a single acquisition plan with an FY 1985 initial operational capability.

Level 4 is an air and ground transportable system which augments the C^3I capability of a large joint task force engaged in a crisis situation or military contingency operations. The concept definition, validation of specific requirements, and an acquisition approach are being developed this year.

(2) E-3A Airborne Warning and Control System (AWACS)

Over 20 of the 34 programmed E-3As (AWACS) are operationally available to perform both North American air defense missions and theater and contingency missions world-wide. The E-3A's long-range look-down radar surveillance and tracking capabilities, combined with the requisite communication links and on-board computational capability, provide a significant upgrade in both theater-level surveillance and C^2. The NATO AWACS program continues in full-scale acquisition and the central features of the joint U.S.-NATO standard AWACS configuration--improved maritime surface surveillance capabilities, the Joint Tactical Information Distribution System (JTIDS) terminal described below, and a higher-capacity computer--will be incorporated in the last 10 E-3As as well as all 18 NATO AWACS. RDT&E funds in the amount of $53.8 million are requested in FY 1982 to continue work on these features and for development and testing of other improvements (especially electronic counter-countermeasures improvements and enhanced C^3 capabilities).

3. Theater Surveillance and Reconnaissance

a. Strategy

The advent of long-range weapons (missiles and strike aircraft) in Soviet land, sea, and air forces has engendered a need for detecting, locating, and classifying of such forces at longer range. The excellent range-payload characteristics of our strike aircraft and the range and precision of ground-launched and sea-launched missiles can be fully exploited only if means are available to find and designate targets at long-range with location accuracy consistent with weapon delivery capabilities and with timeliness consistent with tactical warfighting needs. Theater surveillance and reconnaissance programs are aimed at fulfilling these needs.

b. Key Programs

Key air and land surveillance and reconnaissance programs include the AWACS, described above, which performs a theater airspace surveillance mission and supports maritime surveillance; and the TR-1, described subsequently, which provides deep surveillance of land targets.

The surveillance of open ocean areas presents a distinctly different challenge. Ocean surveillance is the systematic observation of ocean areas to detect, locate, classify and report selected high interest aerospace, surface, and subsurface targets. Over-The-Horizon Targeting (OTH-T) is that part of ocean surveillance which supports tactical naval firepower. The U.S. Ocean Surveillance System includes the sources, sensors, communications, data processing, other facilities, personnel, and procedures which are required to provide needed ocean surveillance data to users in a timely manner.

Within the past decade, sophisticated Soviet challenges to U.S. Navy sea control have increased the demand for improved ocean surveillance and considerable efforts have been expended to achieve essential improvements. The improvement program includes SURTASS, RDSS, OSIS Baseline Processing upgrade, enhanced CLASSIC WIZARD and CLASSIC BULLDOG capabilities, the improved SOSUS program, the Fixed Distribution System, CLASSIC OUTBOARD, and various aerospace surveillance programs.

4. Theater Information Systems

Programs in this mission area are described in Chapter VI.

5. Tactical Command and Control

a. Strategy

Command and control programs for tactical use stress interoperability among the Services and with the forces of our allies. Because tactical C^3 systems are typically procured in large numbers and require substantial maintenance resources and logistics support, we are also emphasizing greater operational utility and standardization. In addition, the FY 1982 program calls for continued development, acquisition, and deployment of electronic warfare counter-C^3 capabilities.

b. Key Programs

(1) Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

The program for Joint Interoperability of Tactical Command and Control Systems (JINTACCS) is designed to assist in achieving interoperability of independent Service tactical command and control systems in joint operations. The program work has been divided into five functional segments: intelligence, amphibious, fire support, operations control and air operations. During the past year, the design documents required for testing were completed, test plans and procedures were developed, and actual testing of the intelligence segment was completed. Also, the configuration management procedures for testing were developed and implemented, and planning for testing the air operations segment was started. The testing will be followed by an Operational Effectiveness Demonstration with actual troops in May 1981.

Control of the Tactical Air Control System/ Tactical Air Defense System (TACS/TADS) configuration management testing, which became part of the JINTACCS Program in October 1980, will be transferred during FY 1981 from the U.S. Navy to the JINTACCS Program. Transfer to TACS/TADS, a natural extension into JINTACCS, will avoid proliferation of test beds and will reduce costs and personnel requirements.

(2) Battlefield Exploitation and Target Acquisition (BETA)

The joint BETA Project was established to demonstrate the feasibility of providing automated assistance to the correlation of intelligence data from multiple sources to achieve a near-real-time display of the ground tactical situation. The purpose is to assist battlefield commanders by developing current enemy situation assessments and target nominations. A planned deployment to Europe in the fall of 1980 was cancelled due to the immaturity of the system resulting in poor system availability and stability. Recovery actions were taken to find and fix existing deficiencies, demonstrate the system capability prior to acceptance from the contractor, complete system documentation and merge assets into the Joint Tactical Fusion Program.

(3) Joint Tactical Fusion Program

In response to Congressional direction, a plan for the Joint Tactical Fusion Development and Acquisition program was prepared and forwarded to the Congress. The plan establishes a Joint Program Management Office with the Army as the Executive Agency, combines the resources of BETA Project with the Army's All Source Analysis System (ASAS) and the Air Force's Automated Tactical Fusion Division (ATFD) programs, and outlines the process for a joint competitive full-scale development leading to the acquisition and fielding of the ASAS and ATFD.

6. Tactical Reconnaissance, Surveillance, and Target Acquisition

a. Strategy

Our programs have the objectives of: augmenting and improving our existing capabilities; extending range and coverage; and increasing information processing.

b. Key Programs

(1) TR-1

A high-altitude, long-endurance aircraft equipped with multi sensors is needed for stand-off surveillance into the second echelon of opposing forces and to complement low-altitude and ground-based sensor systems. In addition to supporting force allocation decisions, such a capability can be used to cue short-range surveillance sensors, and will thereby enable more efficient use of such assets in direct-support target acquisition functions.

The TR-1 program, started in FY 1979, is a tactical reconnaissance variant of the strategic reconnaissance U-2R aircraft. It is capable of long loiter, stand-off surveillance from altitudes above 60,000 feet. Equipped with a high-capacity data link and advanced sensors, the TR-1 and associated ground processing facilities will provide continuous day/night all-weather battlefield surveillance into the second echelon of opposing forces with real-time reporting to both Army and Air Force commanders. The Mission Element Needs Statement for the TR-1 was approved in August of 1979. Work necessary to reopen the U-2R production line was completed in FY 1979 and a production contract was awarded in November 1979. We are requesting $94.6 million in FY 1982 in support of the TR-1 program.

(2) Airborne Surveillance Radars--SOTAS and PAVE MOVER

The Stand-Off Target Acquisition System (SOTAS) is an Army helicopter-borne moving target radar providing real-time close-in surveillance to support division and brigade-level battle management and artillery targeting. Interim systems use the UH-1 helicopter and the APS-94 radar. The EH-60B variant of the BLACKHAWK helicopter has been selected as the radar platform for the procurement system because of its survivability, endurance, and adverse-weather performance. The radar and data link are designed to operate in a severe jamming environment. Although funding constraints have reduced the production rate for the BLACKHAWK helicopter and development problems with the advanced radar have increased cost and delayed availability, SOTAS continues to be a high-priority program. FY 1982 funding requested for SOTAS is $76.8 million.

For the longer ranges, the PAVE MOVER radar will provide a wide-area surveillance, detection, and strike capability. The system, a component of ASSAULT BREAKER, is designed for low probability of intercept by enemy ELINT sensors, and to provide real-time weapons guidance data and cueing to other sensors. PAVE MOVER is a joint effort of the Air Force and DARPA.

(3) Ground-Based SIGINT Sensors

Many of the currently-field systems are nearing the end of their useful lives in terms of both response to changing threats and supportability. Army activities include the procurement and deployment of replacement systems such as TEAMPACK and TRAILBLAZER and development of new systems with high levels of automation to cope with increasing target signal density and complexity. The Marine Corps is developing the Integrated Communications Collection System (ICCS) to meet its projected future requirements. Air Force activities focus on coupling modern receiving and processing technology to systems already in the inventory.

TEAMPACK is a mobile direction-finding system designed to intercept signals from radar jammers, as well as battlefield surveillance, target acquisition and air defense radars. TEAMPACK wheeled vehicle systems have been deployed to overseas locations. Production is underway on the final tracked version and additional vehicles are planned for purchase with FY 1981 funds. TRAILBLAZER is an Army VHF communications intercept and location system. Existing wheeled vehicle sets have been deployed and limited production versions (tracked) are being produced with delivery beginning in 1983. There is no procurement funding for 1982. RDT&E expenditure of approximately $5.2 million in FY 1982 are scheduled for use in developing a series of product improvements to be applied against known and emerging threats.

The Marine Corps Integrated Communications Collection System (ICCS) to replace various non-standard COMINT receivers will provide automated search, technical support and recording assistance.

(4) Airborne SIGINT Sensors

The initial product improvement has been completed and a further improvement program is underway to enhance mission equipment capability and provide interoperability with the TR-1 and associated ground processing facilities. We are requesting $55.8 million in FY 1982 for these continuing improvements.

7. Tactical Communications

a. Strategy

Our acquisition strategy for tactical communications systems and equipment must take into account competing requirements. Our current efforts are aimed at improving capability to perform in a jamming environment, increasing mobility and reliability, and providing means to secure tactical links and circuits against exploitation. At the same time we must increase interoperability with allied systems, and, in the case of a replacement capability, retain compatibility with deployed equipment to ensure a smooth transition.

b. Key Programs

(1) Ground Mobile Forces (GMF) Satellite Communications

The GMF Program is to provide satellite terminals, multiplexers, anti-jam (AJ) modems, AJ control modems and ancillary equipment to support Army, Air Force and Marine Corps tactical communication requirements. GMF terminals will provide the tactical forces with reliable communication links that are independent of terrestrial networks and the physical conditions of the terrain where operations are being supported. The terminals are all highly transportable.

Major GMF procurement activities include:

- o Procurement of AN/TSC-100 and AN/TSC-94 SHF terminals for the Air Force, starting in FY 1981.
- o Continuation of multi-year contract for 225 AN/TSC-85 and AN/TSC-93 SHF terminals for the Army, awarded in FY 1979. We expect to complete procurement in FY 1983. We are planning in FY 1982-1983 to retrofit 25 terminals procured under the initial contract.
- o The FY 1982 RDT&E request is for $16.8 million.

(2) <u>The Joint Tactical Communications Program (TRI-TAC)</u>

The TRI-TAC Program was initiated in 1971 to provide new tactical multi-channel switched communication equipment for all the Services through common development under a joint program. The program is primarily concerned with design, development, and acquisition of trunking, access and switching equipment for mobile and transportable tactical multi-channel systems, associated systems control and technical control facilities; local distribution equipment; voice record, data and ancillary terminal devices; and associated communications security equipment.

One of the primary objectives of the program is to eliminate duplication, thereby achieving economies. Through procurement of common equipment a high degree of interoperability will be achieved. The overall joint management of the program is performed by the Director of the Joint Tactical Communications (TRI-TAC) Office, which was established by the Secretary of Defense. The acquisition of equipment is accomplished by the Services/Agencies as tasked by the ASD(C^3I). The tasked Service/Agency funds the R&D effort for the tasked item and becomes the procuring Service/Agency. The other Service/Agencies provide funding for their share of testing and production procurement.

A contract was awarded to GTE Sylvania in September 1980 for the production of 58 circuit (AN/TTC-39) and message (AN/TYC-39) switches. Development testing and initial operational testing will be completed in 1981 for the TDF (AN/UXC-4), CNCE (AN/TSQ-111) and associated COMSEC. Also in 1981 production contracts will be awarded for the family of DGM equipments (13 items), the digital tropo (AN/TRC-170) and the short range wide-band radio terminal. In addition, numerous development contracts will be in existence. In 1982 we are requesting $108.6 million for continuance of the development contracts, and $202 million for continuance of the GTE switch contract and initiation of the DGM, Tropo and short range wide-band radio contracts.

(3) Joint Tactical Information Distribution System (JTIDS)

The Joint Tactical Information Distribution System (JTIDS) will provide improvements to Navy data links, add a data link to Air Force tactical aircraft, and support the Army's battlefield information distribution needs. Command terminals have entered production for U.S. (and NATO) AWACS aircraft and their associated ground interface facilities to support ECM-resistant communications for surveillance, command and control operations beginning in the early 1980s. Follow-on developments include applications for Air Force and Navy tactical fighters, Navy combatant ships and E-2C aircraft, Army and Marine Corps field unit management, and JTIDS-compatible programs of NATO Allies. The Services are also in process of resolving the problems of interoperability for joint-Service and NATO operations remains.

The Army and Marine Corps will begin procurement of the Position Location Reporting System (PLRS) to improve battlefield management of small units. Army development has also begun on a PLRS-JTIDS Hybrid system to aggregate PLRS information at brigade level and above via tactical JTIDS terminals.

As JTIDS and related technologies support increasing capacities for and combat-reliability of communications, primary operational activity will emphasize techniques of net management and operational employment. The most significant benefits (beyond system security and resistance to ECM or exploitation) are enhancing situation awareness for tactical users and improving force allocation and control at all levels of use.

(4) Combat Net Radio

Command and control of tactical forces is exercised primarily through the use of combat net radios (CNR). The Army is developing, for the use by all Services, a secure, jam-resistant VHF-FM CNR, including manpack, vehicular and airborne versions. The program, in the advanced development phase, is called the Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V), and the Army is presently determining whether fielding of the equipment could be accelerated to about two years earlier than the planned IOC in late 1986. Total procurement will be almost 200,000 radios and 30,000 electronic counter-countermeasures (ECCM) modules. The U.S., in an effort to further interoperability in the ECCM mode and development of NATO technical standards for ECCM, will sign a Memorandum of Understanding with several NATO nations, allowing them to participate in the SINCGARS-V program's Interface Control and Test Integration Working Groups. We are requesting $16.9 million for SINCGARS-V RDT&E in FY 1982.

(5) ECCM for Airborne Radios

The Air Force HAVE QUICK and SEEK TALK programs will provide an ECCM capability for the presently operational ARC-164, the primary UHF radio used by tactical air forces for air-to-air and air-to-ground operations. RDT&E funding for both programs in the amount of $45.6 million is requested for FY 1982. The program entered production (1700 units total) in July 1980 with equipment deliveries starting in late 1980. Modification of the radio will be accomplished by Service personnel. The program is in the advanced development stage. However, the Air Force has decided to accelerate the program by at least one year by starting production in 1983 instead of 1984. Planned production is approximately 8700 units.

8. Electronic Warfare (EW) and C^3 Countermeasures (C^3CM)

a. Strategy

EW and C^3CM systems provide needed means for offsetting technological advances in the deployed weapons of opposing forces, whether they be intended for use against ground, air, or naval targets. EW can operate in several ways to reduce the effectiveness of such weapons, and thereby helps restore the balance against numerically superior forces.

The Soviet Union and its Warsaw Pact Allies continue to make advances in military surveillance, communications, and command and control, with the prospect of substantial improvements in Pact capabilities for precise and timely force management.

Electronic Warfare involves keeping the enemy from using the electromagnetic spectrum as well as retaining friendly use. Our effort in the EW and C^3CM area is designed to complement the effects of other weapon systems in support of our forces and those of our allies. Interoperability and commonality are goals we are striving to attain in new systems and updating our older systems. There is a broad range of lethal and non-lethal programs that provide EW and C^3CM military capability. Most are general or multipurpose. The major programs for which we are requesting FY 1982 funding are described below.

b. Key Programs

(1) ALQ-136

This year, we are requesting $20.5M for the continued procurement of the ALQ-136 self-protection ECM system for protection of Army helicopters. This is the first self-protection jamming system to be included as aircraft survivability equipment for Army aircraft.

(2) QUICK FIX

The Army is transitioning its ALQ-151 QUICK FIX communications jamming system into the new EH-60 helicopters. We are requesting $7.4M for procurement in FY 1982 for this effort.

(3) MLQ-34 (TACJAM)

The MLQ-34 is a track-mounted VHF communications jammer that commenced full-scale production last year. In FY 1982, we are requesting $46.8 million to procure part of the total planned buy which will be completed in FY 1985.

(4) Airborne Self-Protection Jammer

The ALQ-165 Airborne Self-Protection System (ASPJ) is being jointly developed for Navy and Air Force aircraft to meet the projected EW threat for the 1990s. In FY 1982 we will continue with full-scale development with the one contractor team competitively selected in FY 1981 and will be building prototype systems for subsequent test and evaluation. The Navy RDT&E request includes $24.1 million for the ASPJ program and the Air Force RDT&E request includes $34.8 million.

(5) ALQ-126A

For the older Navy aircraft that will not receive ASPJ, we must update the currently deployed self-protection system, the ALQ-126A, to meet the threat through the end of the 1980s. We are requesting $69.5 million in FY 1982 for this purpose.

(6) ALR-67

ALR-67 Radar Warning Receiver, now transitioning to full-scale production, will provide a significant improvement in warning capability against future threats in Navy aircraft. The digital processor from the ALR-67 will be installed in place of the older analog processor in older Navy aircraft that will not be upgraded to the full ALR-67 capability. In FY 1982, $20.5 million is requested for procurement of ALR-67 systems.

(7) SLQ-32

The SLQ-32 provides self-defense EW protection for nearly all of our naval combatants except for carriers that carry a different equipment suite. Initial installations are progressing satisfactorily, and

IOC has been achieved. Test and evaluation was completed in FY 1981. We are requesting $14.5 million in FY 1982 for follow-on production of the SLQ-32.

(8) ALQ-131

We are currently procuring the ALQ-131. In FY 1982 we are requesting $72.1 million.

(9) COMPASS CALL

The COMPASS CALL program will complete test of the first two aircraft in FY 1982, constituting an initial operational capability. We are requesting $47.3 million to continue the COMPASS CALL modification program in FY 1982.

(10) EF-111/EA-6B

The Air Force is requesting $308.9 million to continue the modification and follow-on testing of the EF-111A. This year's request will fund procurement of modification kits and the modification production of aircraft. We are also requesting $215.7 million to continue the production of the EA-6B at the rate of two per year.

VIII. DEFENSE-WIDE COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE (C^3I)

A. INTRODUCTION

Our C^3I systems must support the command function at all echelons, have flexibility to cope with evolving threats and be consistent with planned force composition and employment. C^3I systems must facilitate conduct of U.S. joint operations worldwide and combined operations with Allied forces. Strategic C^3I programs were discussed in Chapter VI, and theater and tactical programs were discussed in Chapter VII. This chapter discusses defense-wide programs which provide an essential backbone for our military capabilities.

B. DEFENSE-WIDE C^3 PROGRAMS

1. Introduction

The following are key requirements for Defense-wide C^3 systems:

- o Worldwide jam-resistant secure communications are needed to link decision makers with commanders in the U.S. and overseas.

- o U.S. military forces throughout the world need secure jam-resistant voice, digital data, and message services to support general C^3 functions. The present Defense Communications System (DCS) includes obsolete equipment and is deficient in endurability/survivability and responsiveness. Improvements are needed to enhance survivability; integrate a data communications capability to facilitate user-to-user message and computer communications; enhance system control capabilities to allow for more responsive restoral, reconstruction, and and extension under crisis and wartime conditions; reduce operation and maintenance costs; and improve interoperability with Allied systems.

- o It is National policy to protect U.S. government telecommunications which carry traffic essential to our national security from intrusion, deception and exploitation. Protection for CONUS links and a global secure-voice switched network are needed.

- Accurate, secure, jam-resistant, all-weather/all-hours navigation and position-fixing is needed for precise world-wide control of forces, with a common grid for reconnaissance, surveillance, and weapon-control functions.

2. Joint and Multiservice Programs

a. Jam-Resistant Secure Communications (JRSC)

The JRSC Program will provide highly transportable satellite ground terminals operating at SHF to major command locations, and selected sensor sites. This deployment will assure major commanders of jam-resistant communications capability independent of DCS terrestrial interconnections under stressed conditions. Contracts have been awarded for the JRSC terminals and the first terminal is scheduled for delivery in January 1983. $49.7 million in FY 1982 will provide the third year increment in the JRSC multi-year procurement contract.

b. Joint Service Weapons Data Link (JSWDL)

The effectiveness of weapons controlled and guided by data links will be determined to a great extent by the resistance of the system to unintentional interference and jamming. JSWDL is a joint Army and Air Force effort to develop qualified electronic modules and subassemblies for a variety of weapon data link applications. The aim is to reduce life-cycle costs and provide performance growth potential. The project is jointly funded in the PLSS, RPV, and SOTAS programs through FY 1983. A generic modular architecture was approved in 1980, and initial tests are scheduled for late 1983. An arquisition strategy, including means for maintaining a competitive industrial base, will be recommended with the aim of establishing a production schedule that is responsive to all users of the modules and subsystems.

3. Position-Fixing and Navigation

a. Satellite Navigation

The NAVSTAR Global Positioning System (GPS) program will provide the backbone for future DoD navigation and position-fixing capabilities. The program envisions an initial deployment of 18 satellites in 3 orthogonal orbital planes at an altitude of 11,000 nm. The system will provide a global common grid, and users will be able to obtain continuously and under all weather conditions precise three-dimensional position and velocity data as well as time. Combat and support aircraft, vehicles, ships and troops will be able to obtain such information without radiating potentially compromising signals, as is the case with some currently deployed position-fixing systems. GPS will play a role in instrumentation for achievement of improved ballistic missile accuracy under the Navy's TRIDENT Improved Accuracy Program. GPS will carry nuclear detonation detection sensors of the Integrated Operational Nuclear Detection System (IONDS) as a secondary payload. This payload is described in Chapter VI.

All segments of the system have been approved for, and are currently in, full-scale engineering development. The FY 1982 request of $221 million provides funds for continued competitive development of user equipment as well as development of the space and ground control segments.

b. <u>Mapping, Charting and Geodesy (MC&G)</u>

MC&G RDT&E improves both ground and space positioning using techniques such as satellite-to-satellite tracking, satellite altimetry, very long baseline interferometry and inertial technology. The development of a space receiver using NAVSTAR GPS signals continues to receive special attention. RDT&E programs enhance target positioning and gravity field modeling and provide compensation for gravity effects on inertial guidance and navigation systems. These efforts directly improve ICBM and SLBM effectiveness. Efforts in gravity and geo-magnetic field modeling are projected to enhance operations of naval forces, especially safe transit and concealment of SSBN's. Development efforts concerning more precise trajectory, launch and target data to support the unique capabilities of the M-X system are progressing with emphasis on timeliness and increased reliability. Additional MC&G R&D efforts include simulation techniques for preparation of target reference scenes required for guidance of the PERSHING II missile as well as scenes required for DARPA's advanced cruise missile technology programs. TERCOM matrices for cruise missiles and other systems are being studied for use in terrain comparison guidance and correlation navigation methods. Photo-bathymetric methods for shoal detection and and remote sensing techniques for terrain analysis are being investigated to support military needs for geographic intelligence. Emphasis is placed on an analysis of gravity effects on weapon systems and on digital data base products for direct employment in advanced weapon systems and simulators.

4. Defense-Wide Communications Programs

a. The Defense Satellite Communications Systems (DSCS)

DSCS, a Super High Frequency (SHF) satellite communications system, is key to linking the NCA and other priority U.S. agencies with forces located overseas. In addition to large fixed earth terminals, mobile terminals will be available to support WWMCCS requirements and some tactical Service requirements. The demand for DSCS capacity, area coverage, and reliability has established the need for a six-satellite space segment comprised of four active satellites and two in-orbit spares. The space segment now consists of seven DSCS II satellites, located over the Atlantic, Western Pacific, Eastern Pacific and Indian Ocean areas. To maintain this system until follow-on DSCS III satellites are launched, only two remaining satellites are available. These are now being delivered, and are currently scheduled for launch with the DSCS III Demonstration Flight satellites discussed below. The DSCS III qualification model satellite is being refurbished for flight to assure communications continuity until DSCS III production satellites become available in late 1984.

DSCS III satellites are being developed as replacements for the aging DSCS II spacecraft to maintain space segment continuity for the DSCS Program. The new satellites will provide greater satellite life as well as a major increase in communications capacity particularly under jamming over the DSCS II satellites. A number of improvements are being incorporated, including multi-beam antennas that will provide more flexible service to both large and small terminals and will significantly improve communication performance against uplink jamming signals. A special capability for survivable EM dissemination has been included. Two R&D DSCS III Demonstration Flight Satellites are being assembled and the first is now scheduled to be launched for on-orbit validation tests in mid-1981. In FY 1982, we plan to procure two production spacecraft from the first of several DSCS III satellite production runs planned during the 1980's.

b. Secure Voice Improvement Program (SVIP)

The Defense Communications System SVIP objective is to provide secure voice capability to approximately 10,000 DoD users and be interoperable with the major new secure voice initiatives of our tactical forces, NATO Allies and the non-DoD elements of the Federal Government. The program concept was approved by Congress in the FY 1980 budget review cycle and RDT&E of the new secure voice terminals has begun. However, the extended time (1987) before production terminals become available necessitates the interim use of secure terminals previously developed for the tactical secure voice community. The use of these terminals coupled with improvements in the quality, reliability and flexibility of the existing AUTOSEVOCOM I network will permit the DoD to double the number of narrow band secure voice users within the next two fiscal years. The FY 1982 budget request includes $15.8 million.

c. AUTODIN I and AUTODIN II

The Automatic Digital Network (AUTODIN) is the principal switched digital communications network for data and narrative communications of the DoD. AUTODIN I has been in operation since the mid-1960's. AUTODIN II will achieve IOC during 1981 and will provide query-response and interactive computer communications support. The initial stage of the AUTODIN II program will provide DoD the ability to meet the majority of the projected long-haul data communications needs in CONUS. Its rapid response capability will allow us to consolidate a number of dedicated computer networks. Plans for extending AUTODIN II service overseas are currently under development. We are requesting $10.3 million in FY 1982 to lease the AUTODIN II system.

d. Digital European Backbone (DEB)

DEB is an ongoing program that will convert a major portion of the existing European DCS to an all digital system. Stage 1 of the four stage program was declared fully operational on 13 November 1979. This stage of the program provides digital transmission facilities from Coltano, Italy, to HQ USEUCOM at Vaihingen, Germany, and connects with the FKV pilot digital transmission system at that location. The remaining three stages will extend the digital backbone throughout Germany, southern Italy, the Benelux nations, and through southern England to Croughton; connects U.S. base locations throughout these countries into a wideband digital system with numerous alternative route capabilities. Bulk encryption is employed throughout DEB, thereby denying critical information to enemy intelligence sources. Under the current funding levels, the full operational capability for the DEB is planned for 1987/1988. The FY 1982 procurement request is $5.2 million.

e. NATO/U.S. Interoperability and Mutual Efforts

(1) Satellite Communications (SATCOM) Sharing

The U.S., U.K., and NATO have signed a Memorandum of Understanding (MOU) that provides for sharing of power and bandwidth to satisfy critical communications requirements in the event of a satellite failure to either of the other's systems. This capability proved to be invaluable for the U.S. on several occasions. After a launch delay seriously degraded DSCS service, NATO launched its NATO III B satellite early and positioned it over the Eastern Pacific for U.S. use in 1977. The initial one-year loan was extended when the U.S. experienced a launch failure in 1978. In early 1979, we returned the NATO III B to the Atlantic where it remains as a NATO back-up. The U.S. and NATO defense satellite systems will be even more supportive and interoperable in the 1980's when the DSCS III and NATO IV space segments become operational. U.S. involvement in NATO IV design as well as the consideration of DSCS III satellites for the NATO IV system, will result in many common features. Consequently, NATO IV may look exactly like a DSCS III, or it will be a design that is similar enough to be extremely useful to the U.S. in an emergency.

(2) Mutual U.S./NATO Support

The NATO Integrated Communications System (NICS) is designed to meet the political and command-and-control communications requirements of NATO political civil and military authorities. The first stage which provides automated record and voice communications and a limited degree of communications security, is being implemented and will be completed in the early 1980's. The architecture for NICS

Stage II foresees an all-digital, survivable and secure network interlinked with commercial telephone systems and national strategic and tactical networks. It is programmed to be completed by the end of the century at an estimated cost of $2 billion. We are taking several actions to interconnect our communications systems with those of NATO. They include:

- o Interconnection of the NATO tropospheric scatter communications system and the DCS (accomplished).
- o Interconnection of NATO's existing record traffic network with the U.S. AUTODIN (completed).
- o Automated interoperation of the NICS TARE as implemented in 1981-84 and the U.S. AUTODIN systems (agreed).
- o Joint use of the Iceland SATCOM Ground Terminal (agreed).
- o Interconnection of U.S. tactical systems with the NICS through the NATO standardization program (STANAG) 5040 interface unit (underway).
- o Plans for automated interconnection of U.S. tactical and strategic communications systems with the NICS Stage II (underway). To fulfill our responsibilities, the Director, DCA, is designated the U.S. Manager for coordination of U.S. National projects identified in NICS plans and programs for implementation.

(3) <u>Consolidation of U.S. and NATO Communications Facilities</u>

Several actions which are underway or complete will increase the flexibility and interoperability of U.S. and NATO C^3 systems in the Norfolk, Virginia area. In 1978, the SACLANT and CINCLANT communications centers were consolidated. Additionally, a joint U.S./NATO transmission link connecting collocated satellite ground terminals in Northwest Virginia to SACLANT and CINCLANT headquarters in Norfolk, Virginia is planned to be operational in mid-1981. SACLANT initiated an effort to interconnect the NATO Command and Control Information System (CCIS) with the U.S. Navy Local Digital Message Exchange to speed message handling. SACLANT is conducting a study of the technical ramificiation of the interconnection on the NATO CCIS.

f. <u>Communications Security (COMSEC)</u>

DoD Communications Security (COMSEC) programs are directed toward providing sufficient security for U.S. Government telecommunications systems so that the intelligence value to the opposition to be gained from exploiting these systems will be less than the cost of doing so, in terms of time, difficulty and expense. Achieving these objectives requires not only the procurement of cryptographic equipment for protecting voice, record and data communications and telemetry signals, but also an increasing commitment to threat and vulnerability assessment programs to help identify, describe and prioritize vulnerabilities, and a strong technology program to reduce power requirements and lower cost; while meeting the need to protect links operating at higher data rates and to achieve improved reliability and survivability. Use of existing transmission facilities necessitates greater sophistication in voice processing equipments. Applications of commercially available, low-cost microprocessors are being pursued. Other developments are aimed at integrating appropriate COMSEC measures during the early design and development phases into new and advanced communications systems, including general and special purpose air, sea and land networks, command and telemetry of space and weapon systems, and nuclear command and control.

g. The European Telephone System (ETS)

The European Telephone System is to be the integrated general purpose common user voice system for U.S. forces in Europe, and a component of DCS. Operation and maintenance of the antiquated equipment of ETS is heavily labor intensive and does not provide a reliable, responsive, and cost-effective system. The DEB project will improve the transmission system; and the ETS project will replace telephone switches. A contract was signed with the German government in April 1980 to buy 112 replacement switches for U.S. Army locations for a price not to exceed 186,000,000 DM. In addition, the U.S. Army will procure eleven switches for U.S. Air Force use and three system control units. By purchasing the new digital switches in Germany, interoperation with the German telephone system will be enhanced and equipment operation and maintenance will be simplified. Furthermore, the ETS will be interoperable with the NATO Initial Voice Switches Network and the NATO Integrated Communications System Stage II.

C. INTELLIGENCE PROGRAMS

1. Introduction

Defense intelligence has four major objectives:

- Support operational commanders, during peacetime and all phases of military conflict.
- Provide indications and warning information concerning capabilities and preparation for attack by hostile powers on the U.S. or its Allies and other situations affecting the national interest.

- Support national-level intelligence needs, of the NCA, for policy and planning, and of the Director of Central Intelligence for national foreign intelligence.

- Support Departmental requirements, to promote readiness, develop U.S. weapon systems and policy, and arm and structure the combat forces of the U.S.

Some areas of Defense intelligence requiring improvement are:

- Wartime survivability and endurance of intelligence assets.

- Interoperability of intelligence assets with our C^3 structure, to insure that intelligence can be provided in a timely manner to commanders.

- Mapping, charting, and geodesy support, to achieve improved accuracies for new weapons systems.

- Long-range technical threat projections, in support of weapon system acquisition decision-making.

- Capability to monitor enemy activities at night or in bad weather, for indications and warning, support to combat commanders, and treaty-compliance monitoring.

2. National Intelligence

The national intelligence effort is embodied in the National Foreign Intelligence Program (NFIP), which comprises a significant portion of the intelligence efforts of the Departments of Defense, State, Energy, and Treasury, and the Drug Enforcement Agency, as well as the CIA and the counterintelligence efforts of the FBI.

Within the Defense portion of the NFIP, there are five major intelligence programs--the Consolidated Cryptologic Program, General Defense Intelligence Program, Air Force and Navy Special Activities, and DoD Foreign Counterintelligence Activities.

Within the Defense budget are programs integral to the strategic and general purpose forces and which support tactical commanders in the use of their forces. These activities, as a secondary function, provide intelligence to national-level consumers, as national intelligence programs conversely provide information for military commanders. The two processes are complementary, rather than duplicative.

3. Tactical Cryptologic Program

The Tactical Cryptologic Program (TCP) is a major component of DoD tactical intelligence and related activities. The long-range goal of the TCP is to maintain and selectively strengthen the capability to provide effective SIGINT to the commanders of combat forces. The major objective is to provide a structure within DoD for tactical SIGINT systems to ensure maximum interoperability, minimize duplication, and produce a sound R&D, procurement, operations and training base consistent with service missions, personnel capabilities and force level .

4. Defense Reconnaissance Support Program (DRSP)

The resources of the Defense Reconnaissance Support Program (DRSP) are a consolidation of Military Service and Defense Agency program elements developed as a part of the Planning, Programming and Budgeting System of the Department.

5. Intelligence Support to Tactical Forces

During the past year, we have addressed potential improvements to timely intelligence support to tactical forces. The specific objectives are to enhance qualitatively the multi-source information which is essential to combat commanders and directly related to their missions. The requirements encompass correlating and disseminating highly perishable data quickly enough to enable accomplishing combat decisions and actions. We have made significant progress in defining intelligence support requirements of operational military forces, and in developing more effective mechanisms for guidance and review in the planning, programming and budgeting process. Our long-term goal is to develop a requirements-oriented acquisition strategy with overall resource allocations for Defense NFIP, and tactical intelligence and related activities that will ensure the most effective peacetime and wartime intelligence support to tactical commanders.

IX. DEFENSE-WIDE MISSION SUPPORT

A. TEST AND EVALUATION

1. Objective. The major objectives of DoD Test and Evaluation (T&E) Programs are to:

   - Conduct development test and evaluation of weapon systems to minimize acquisition risks.
   - Conduct operational test and evaluation to determine the operational effectiveness and suitability characteristics.
   - Provide credible, independent assessments of the technical, operational and support characteristics of DoD weapon systems in support of the acquisition process.
   - Develop and maintain a major range and test facility base to support weapon system test and evaluation.
   - Conduct joint-Service operational test and evaluation programs which address tactics and hardware development, adequacy of doctrine and strategy and long range support and force planning concepts.
   - Conduct foreign weapon testing and evaluation in support of foreign weapon procurement activities.

2. Major Weapon System Testing.

The primary role of DoD T&E activities continues to be the assessment of weapon system operational effectiveness and suitability.

Major defense programs for which significant testing is planned in FY 1982 are shown in Table IX-1, categorized by their present relationship to Defense Systems Acquisition Review Council (DSARC) milestones.

TABLE IX-1

MAJOR DEFENSE PROGRAMS

Testing in Preparation for Milestone II Decision	Testing in Preparation for Milestone III Decision		Post Milestone III Testing	
WAAM	F-18	AIM-7M	FVS	TRIDENT I
ALWT	AAH	AIM-9M	E-4B	STINGER
IWD Mine	MX	HARM	GSRS	Copperhead
TRI-TAC Components	SLCM	TACTAS	XM-1	Patriot
Acoustic Sensors	ASPJ	CAPTOR	CIWS	SSN-688
AMRAAM	GLCM	SOTAS	ALCM	SURTASS
LCAC	AV-8B	DIVAD	CG-47	ASMD-EW
5" RAM	ACM	NAVSTAR	JTIDS	EF-111A
	PLSS	LAMPS	SOSUS	AEGIS/CSED
	PERSHING II		CH-47D	C-5 Wing Mod
	IIR MAVERICK		ROLAND	
	SPACE SHUTTLE/IUS		Adv Tanker/Cargo Acft (KC-10)	
	JTIDS(Class II Terminal)		TRI-TAC Circuit Switch	
	HELLFIRE		TRI-TAC Message Switch	
	DSCS-III			

To support our primary mission we will continue during FY 1982 to emphasize the need for early determination of quantified system operational performance requirements, the timely submittal of Test and Evaluation Master Plans (TEMPs), and the utilization of early operational testing as an effective method of expediting system maturity.

The independent Service test agencies play a key role in the DoD weapons acquisition process and have successfully sponsored significant improvements in test procedures and techniques which are responsible for the thoroughness reflected in weapon system performance assessments. Technology advancement and innovative weapon system design will continue to require comparable advancement in testing technology and procedures if our T&E activities are to be able to evaluate true system operational capabilities. Accordingly, in FY 1982 we will encourage significantly greater interaction between the Services' T&E elements and developing agencies so that realistic quantitative and demonstrable performance objectives can be established and matched with appropriate testing technology in a timely and cost effective manner.

In support of testing technology advancement, considerable attention is being given to the effective utilization of system test beds, simulation techniques, and software performance evaluation. The recognition of system testbed and simulation limitations is critical to the successful use of these testing aids as is the ability to demonstrate, quantitatively, the adequacy of software performance. More effective utilization of testbeds and simulators will provide fundamental enhancements to our future testing efforts. Close coupling of measured results obtained in realistic field testing with simulators and testbeds will continue to be emphasized to quantify risks and resolve critical test issues.

Implicit in modern weapon system design is the continually increasing importance of computer software which is embedded in weapon system computer architectures. Early involvement of the test and evaluation community in the development cycle of embedded computers permits timely evaluation of all software life cycle activities and ensures that software specifications include user performance and implementation considerations. This integrated approach is expected to reduce significantly the severity and number of software deficiencies uncovered during operational testing of production configured systems.

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3. Test Facilities and Resources.

The Major Range and Test Facility Base (MRTFB) Directive (DoDD 3200.11), containing the overall policies for management and operation of the DoD ranges and test facilities, was recently revised to improve test support efficiency. The principal policy changes place all T&E facilities under the Uniform Funding Policy and require full reimbursement from non-DoD users. Additional policy revisions address avoidance of unnecessary duplication of test capability and require a range usage priority system that gives equitable consideration to all prospective DoD users regardless of component affiliation.

The program of accelerated improvement and modernization of the MRTFB continues. This past year we initiated a Strategic Systems Test Support Study (SSTSS), chaired by the Air Force with participation of the other Services. The principal objective of the SSTSS is to examine alternative configurations of fixed land stations and mobile air and sea instrumented platforms to support future strategic offensive and defensive test requirements. Early evaluation results indicate significant savings potential through consolidation of ship and aircraft strategic support resources while providing full support to all test user requirements.

The High Energy Laser (HEL) Systems Test facility at White Sands Missile Range (now separately funded in a new PE: 65806A) will be moving from the design stage in early FY 1981 to the construction phase, with site activation presently scheduled for late FY 1982 and construction of the Phase I facility completed a year later. This site will permit us to consolidate our HEL facilities now scattered throughout industry and government into one principal High Energy Laser test facility geared to demonstrate the potential of this new technology.

We have initiated efforts to secure an agreement from the Government of Canada which would permit us to utilize Canadian test sites when either terrain and/or weather influenced operational performance is to be evaluated. Canada's unique European-like weather and terrain provides a NATO-like environment at substantially reduced costs compared to testing in Europe.

The Services continue to benefit from their test facility modernization programs. For example, the expanded real time data system, supplemented by the central scientific computer and mission simulation laboratory at the Naval Air Test Center is operational and of major benefit to the F-18 test program. The telemetry integrated processing system at the Western Space & Missile Center, will be operational for the M-X program providing real time data for range safety and mission control and accelerated availability of post flight telemetry data. Elements of the Automatic Data Acquisition and Processing System at Aberdeen Proving Ground are already providing improved data with accelerated data reduction and near real time trial validation.

4. Joint Operational Test and Evaluation (JOT&E) Programs.

JOT&E refers to T&E conducted jointly by two or more DoD components to evaluate capabilities of developmental and deployed systems in a multi-Service combat arena, to evaluate joint operational concepts and tactics, and to assess inter-operability of systems and forces. We have substantially improved the JOT&E management process by developing an architecture that assures Service participation in the early program phases i.e., Joint Test nominations, test design, planning, and budgeting. This architecture is documented in a forthcoming DoD Instruction entitled "Joint Test and Evaluation Procedures Manual." Full implementation of this new architecture will begin in FY 1981. As shown in Table IX-2, eight JOT&Es will be ongoing during the coming year, two others will be in the initial stages of activation, and two additional tests will be undergoing feasibility evaluation as possible FY 1983 new starts.

TABLE IX -2

FY 1982 ONGOING AND NEW JOINT TESTS

ONGOING TESTS

Counter-Command, Control and Communications *
Data Link Vulnerability
Electro-Optical Guided Weapons Countermeasures/Counter Countermeasures
Electronic Warfare During Close Air Support
Identification of Friend, Foe, or Neutral
Central Region Airspace Control Plan *
Theater Air Defense *
Forward Area Air Defense *

NEW STARTS

Joint Logistics Over the Shore II
Joint Direction Finding
Air Base Defense *

* Feasibility Studies Ongoing

5. Foreign Weapons Evaluation (FWE) Program.

Starting in FY 80, Congress assigned the management and administration of the FWE Program to OSD. This program supports technical and/or operational evaluation of foreign nations' weapon systems and technologies with a view toward avoiding unnecessary duplication in development. To date several foreign designed weapons have been adopted by DoD components while other systems evaluations are nearing completion and appear to be favorable procurement candidates.

During FY 1982 additional emphasis will be placed on expanding the number and types of foreign systems to be evaluated. This will be accomplished by requesting the Services to nominate for consideration foreign systems which address combat related support requirements such as decontamination equipment, small arms, munition ground handling equipment, and combat engineering support hardware. A second initiative will increase the Service Field Agencies awareness of the Foreign Weapons Evaluation Program. This initiative was begun in FY 81 on a limited scale and resulted in a substantial increase in nominated programs from which the most promising were selected. Additionally, in FY 1982 we will emphasize full utilization of newly signed Memorandums of Understanding dealing with the exchange of weapon system test and evaluation data. Availability of these data will assist in the planning of essential testing thereby reducing the cost of individual evaluations.

Finally, efforts to assist our Allies in improving their test and evaluation processes and in developing and using their test resources continues. Such assistance has recently been provided to the Republic of Korea.

B. SPACE AND ORBITAL SUPPORT

1. Space Shuttle

We are moving toward the transition of all space system payloads from launch on current expendable boosters to launch on the Space Shuttle after the Shuttle becomes operational in September 1982. Our primary interest lies in the potential benefits offered by the unique capabilities of the manned, reusable Shuttle. Compared with existing expendable boosters, the Shuttle will offer increased reliability; increased payload weight and volume capacity; and the capability to recover and refurbish spacecraft for reuse, to conduct on-orbit testing and repair of spacecraft or experiments, and to assemble large structures in space. Most important, the Shuttle offers increased flexibility. These unique features prom new operational concepts and increased effectiveness and economies for our military space operations.

a. Inertial Upper Stage (IUS) (RDT&E: $31.8 Million)

The IUS is being developed for use on Shuttle launches to deliver DoD spacecraft to higher orbital altitudes and inclinations than the Shuttle alone provides. It will be used by NASA for a number of their missions. DoD will use the IUS on TITAN III to improve mission success and reduce costs during the early Shuttle transition period. Technical problems with the IUS solid rocket motor, delays in software development and testing, and late delivery of electronic piece parts have delayed the initial launch capability until April 1982 for use on TITAN and until July 1982 for use on Shuttle. However, we believe that all operational requirements can be met. In FY 1980, significant cost increases were incurred and reprogramming requests were approved by the cognizant Congressional committees during April 1980. The full-scale development activity includes fabrication of nine user-funded, pre-production vehicles to support both DoD and civil early operational requirements.

b. <u>Vandenberg Air Force Base (VAFB)</u>
<u>(RDT&E: $162.2 Million, Procurement: $184.2 Million)</u>

We are providing a Shuttle launch and landing capability at VAFB to support high inclination DoD launches. Launches into sun synchronous, polar, or near polar orbits cannot be conducted from Kennedy Space Center (KSC) without unacceptable performance loss and/or over-flight of populated land areas during launch. We will phase our capability to conduct Shuttle operations from VAFB starting with an initial capability of six launches per year in June 1984 and building toward a final capability to conduct up to 20 evenly spaced launches per year by mid-1986. This phased approach allows us to incorporate changes at VAFB which may be necessary based on early flight experience at KSC, minimizes early year expenditures while satisfying near term requirements, and assures that the VAFB Shuttle facility will be properly sized to meet national needs.

Shuttle weight growth now dictates that additional thrust is needed to meet long term performance requirements. Various performance augmentation options to the basic Shuttle configuration are being considered by NASA. The launch pad and launch mount are being designed and constructed to accommodate the eventual choice.

VAFB facility construction will continue in FY 1982. FY 1982 MILCON funding for VAFB includes the Port Hueneme Solid Rocket Booster

Disassembly facility, and various supporting facilities such as harbor modifications, external tank tow route, as well as facilities for parachute refurbishment, flight crew and equipment, and additional engineering space.

c. Operations Capability Development

(RDT&E: $78.3 Million, Procurement: $41.1 Million)

Other Shuttle activities include preparations for DoD launches at KSC, payload integration, and mission operations capabilities development, including DoD modifications at Johnson Space Center (JSC), KSC, and Goddard Space Flight Center (GSFC). DoD planning for early Shuttle launches is based on using NASA's JSC for simulation, training, and Shuttle flight control for all DoD missions. Since the JSC facilities, as presently designed, cannot concurrently handle classified and unclassified payload data, we have worked closely with NASA to define needed modifications. A modification approach has been validated that assures minimally adequate protection of DoD classified data and has a minimum impact on concurrent civil space operations. Similar approaches are being taken with KSC and GSFC for protection of classified data and operations. This approach, called the Controlled Mode, is now being implemented. Detailed design modifications of the JSC facilities and procurement of essential additional equipment will continue in FY 1982. Additional modifications will be made to the existing Solid Motor Assembly Building at KSC to create a DoD Shuttle payload integration facility.

2. Consolidated Space Operations Center (CSOC)

(RDT&E: $19.9 Million)

In the past year we have continued to examine a Consolidated Space Operations Center (CSOC) to augment and back up present satellite control capability at the Satellite Test Center (STC) and provide a dedicated DoD Shuttle control capability in the future. The CSOC will enable us to decrease the present vulnerability of space systems by eliminating single critical nodes for both satellite (the STC) and Shuttle (JSC) control. It will also provide the management and control needed for our military space operations in the post-1986 time-frame. Thus, the CSOC and STC can provide a significant mutual backup capability for our highest priority space programs.

In FY 1982 detailed design and development activities leading to a mid-1986 IOC for CSOC will continue. We plan to acquire the CSOC control capability via a phased approach whereby control capabilities are added over time, as needed. This will permit us to incorporate changes and take advantage of cost savings that may become apparent based on early flight experience at JSC.

C. GLOBAL MILITARY ENVIRONMENTAL SUPPORT

1. Objectives

Accurate, reliable knowledge of the past, present and future state of the atmosphere and oceans is necessary for effective execution of our military mission. Used properly, this critical information is a powerful force multiplier, enabling better employment of our military forces. Lack of critical weather information can endanger our forces and jeopardize the mission.

2. Management

There are substantial civilian weather programs which answer some of our defense needs. We build upon this foundation for our specific military requirements. The military weather programs are each managed at the Service level to retain responsiveness to the specific Service needs, but are coordinated by my office to insure that our total requirements are met at minimum cost and to facilitate interagency coordination.

3. Current Service Programs

The Service programs are focusing on the acquisition of weather data in a battlefield environment, the critical transformation of those data to useful information, and the delivery of that weather information to the operational decision maker.

This year's program includes the completion of the tactical decision aids for the employment of infrared weapon systems. These decision aids can be used to evaluate existing and forecast weather conditions in terms of the successful use of various infrared weapons. We will continue to develop those battlefield decision aids required for effective employment of visual and millimeter wave systems.

We will add the capability to the Navy shipboard Tactical Environmental Support System (TESS) to forecast conditions which will influence the use of the electro-optical weapons in a marine environment. TESS will transition to engineering development this year with production beginning in 1984. The system is designed to be evolutionary, with software modules added as new weapons with differing environmental sensitivities enter the operational inventory. TESS will use data from the Fleet Numerical Oceanography Center, on-board climatic data files and shipborne ocean and atmospheric sensors, providing for optimum operation over a full range of conflict scales.

A more difficult problem is the timely acquisition of weather data from enemy controlled or uncontrolled land battle areas or airspace. Although the Defense Meteorological Satellite Program is expected to contribute significantly in this area, much of the required weather data cannot be obtained from satellite sensors. The Air Force Battlefield Weather Support program is targeted at this critical void. The program was initiated in FY 1981 and will move, in FY 1982, into a major advanced development phase in which sensors and platforms will be evaluated. A prototype system is expected to be complete by early 1984. The system will provide weather data for many varied battlefield missions such as close air support, helicopter operations, chemical smokes, etc. These data will be communicated throughout the battle area by means of the Tactical Automated Weather Distribution Systems, also under development.

4. Interagency Programs

The Department of Defense has an extensive infrastructure of military installations within the CONUS. Many of these bases require weather equipment for safe support of operation and for resource protection. Because of considerable commonality between these military requirements and the similar requirements of civilian facilities, we take advantage of the opportunities for cooperative development of equipment and systems.

The Next Generation Weather Radar (NEXRAD) is a prime example of interagency system development. The Departments of Defense, Transportation and Commerce have formed a Joint Systems Program Office for NEXRAD with the request for proposal for the first phase of development to be issued in early 1981. These same Departments are presently completing arrangements for the formation of a Joint Systems Program Office for Automated Weather Observations Systems (JAWOS). The JAWOS office will explore a common sensor system which will permit a more economic application of advanced technology to the automation of the weather observation functions. Such a system will increase reliability of the observations and reduce the staff time currently employed in this task.

We are continuing to explore other areas where common requirements would indicate common solutions. To this end, we have assigned two senior military weather officers to the Office of the Federal Coordinator for Meteorology. These officers ensure that the Department of Defense weather requirements are met in a responsive, cost-effective manner.

5. Environmental Satellite Program

a. The Defense Meteorological Satellite Program (DMSP)

DMSP is an ongoing operational system which provides worldwide weather information to support strategic and tactical defense missions. The satellites record weather data which are later transmitted to stateside readout sites, and are processed by the Air Force Global Weather Central (AFGWC) and Fleet Numerical Oceanography Center (FNOC) to meet requirements for global military operations. Additionally, the spacecraft directly transmit local weather to tactical Air Force and Navy sites located in key overseas commands. The Navy has processing equipment on its major aircraft carriers, and the Marine Corps is acquiring the new Mark IV tactical readout vans for use in exercises and contingency deployments. The high resolution (one-third nautical mile) imagery is used by the Army for field exercises, intelligence, and employment of reconnaissance. With its secure communications, DMSP may be the only worldwide strategic and local tactical weather data available to the decision-maker in the event of hostilities.

b. National Oceanic Satellite System (NOSS)

NOSS is a multi-agency satellite venture for making ocean observations from space. The system is sponsored by the Department of Defense (with the Navy as executive agent), the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce. For the first planned spacecraft launch in 1986, a ground processing facility, data archive, and near real-time communication system will be operational making this a full-up system. NOSS will provide sea surface wind, temperature, wave height, gravity measurements, precipitation, ice extent and ocean current information, all of which are vital to naval operations. These data will also benefit the civil community involved in ocean activities. After a limited operational demonstration, DoD and NOAA will jointly operate the system. Contracts have been awarded for the initial concept studies. We will closely monitor these studies for continued reassessment of DoD sponsorship in future years.

D. TRAINING SUPPORT

1. Objectives

Over the next decade, much of our current military hardware will be replaced by more sophisticated systems incorporating advanced technologies developed during the 1970's. Over the same time period, the Armed Services will be forced to compete for a larger share of the shrinking population of young people needed to operate and maintain these systems. The objective of our training and personnel systems technology program is to provide the human factors, education and training foundations for designing and supporting these new military systems. Available technologies represented by microcomputers, educational aids and electronic games are being exploited and adapted to optimize training for recruits of all backgrounds and capabilities. Human factors technologies with broad application potential are being developed and applied to new and upgraded systems to improve personnel utilization and effectiveness.

2. Service Programs

Computers can now recognize spoken commands and respond verbally to the user. Since voice recognition technology promises to make system control, data entry and retrieval more efficient, we are evaluating the cost effectiveness and impact of incorporating this and other emerging technologies into future weapon systems, training devices and simulators.

The Services' emphasis on maximizing our tactical and strategic force effectiveness at the lowest possible cost has placed a heavy demand on training as a force multiplier. In response to this need, more accurate techniques are being developed to estimate manpower, skill, education and training requirements. In addition, tracking systems are being developed to monitor the quality and effectiveness of the entire military education and training system.

Examples of some broad-based Service programs which will be continued are:

- Develop and demonstrate training capabilities which are embedded in or a part of fielded systems to allow more realistic training with actual equipment.
- Demonstrate alternative approaches to maintenance training such as low-cost portable and hand-held devices which can be employed by personnel, whether in the classroom or in the field away from instructors, for refresher training and as an aid to actual system maintenance.
- Development of computer-controlled video-disc systems and other education-related technologies that can assist in recruiting, personnel testing and training.

E. STUDIES

Studies are a high leverage investment to support decisionmaking throughout the Department of Defense. They are utilized to address the myriad of complex issues and dynamic problems facing the Department, both in the long and short run; examine and assess the implications and consequences of current and alternative policies, plans, operations, strategies and budgets; and gain insight into the complex technological, military, political and acquisition environment in which future defense decisions and problems will be posed, considered, and made. Studies constitute an essential tool of management. They provide independent and objective analyses and new ideas for supporting the mission of the Department of Defense.

This past year the Department has undertaken a number of initiatives to improve our management of studies. The DoD Ad Hoc Group on Studies was formed to provide guidance and direction for improving the management of studies in the Department. An improved Budget Exhibit for use with Congress was developed by the OSD Comptroller to provide a detailed breakout of funding sources and totals for studies and analyses, consultants, management and professional services, and engineering technical services. Work is underway to revise the current DoD Directive governing the management and conduct of studies. This new Directive will set forth broad policy guidance for managing and controlling the conduct of studies in DoD while leaving the authority for initiating and managing Studies to the users. We plan to establish a Coordinator of DoD Studies in the Office of the Secretary of Defense to serve as a focal point for all DoD Studies. Lastly, efforts to develop an improved management reporting system to better document, justify, and demonstrate the end use to which studies are put is underway.

Specifically in FY 1982, $26.3M is requested to provide the minimal essential technical support to the Office of the Secretary of Defense and the Organization of the Joint Chiefs of Staff.

APPENDIX A

A- 1. RDT&E by Component

A- 2. Procurement by Component

A- 3. RDT&E/Procurement as Percent of DoD

A- 4. RDT&E by Mission Category

A- 5. RDT&E by Activity Type

A- 6. RDT&E by Performer

A- 7. RDT&E by Defense Programs

A- 8. Procurement by Defense Programs

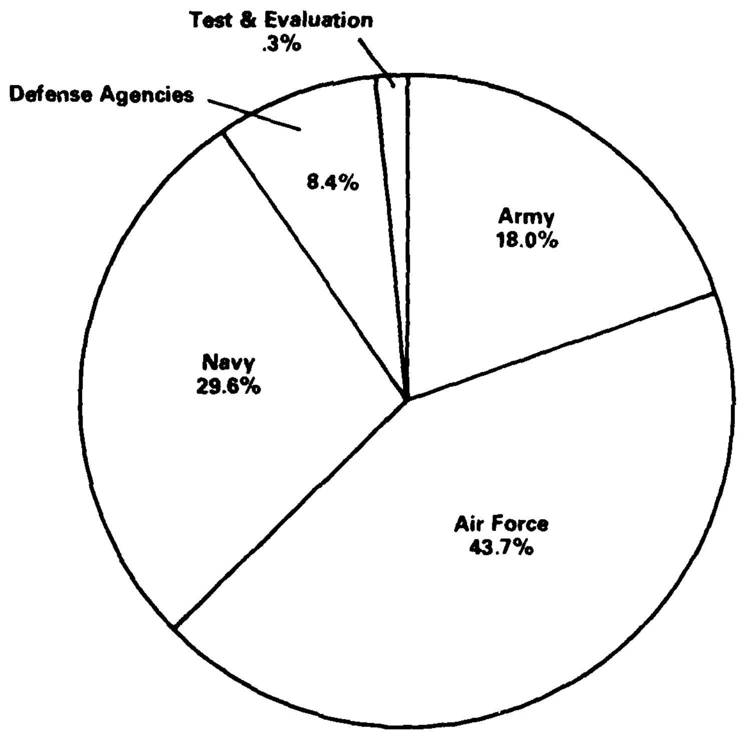
A- 9. Procurement by Appropriation

A-10. Procurement by Authorization

RDT&E BY COMPONENT
($ MILLIONS)

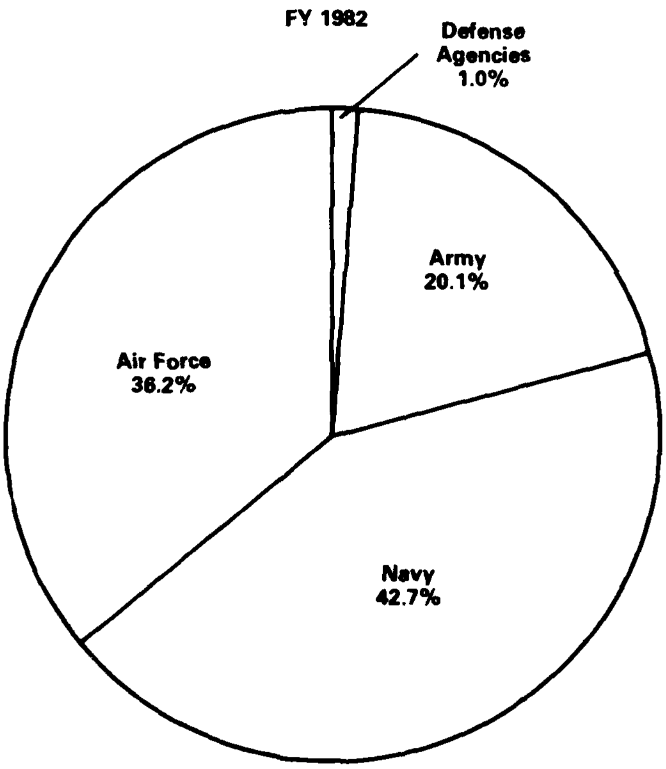
	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Army	2,846.4	21.1	3,086.8	19.2	3,577.2	18.0	4,172.1	19.6
Navy	4,563.3	33.8	4,895.1	30.5	5,866.3	29.6	5,970.7	28.0
Air Force	5,001.0	37.1	6,775.8	42.2	8,669.4	43.7	8,972.6	42.1
Def Agencies	1,041.7	7.7	1,254.6	7.8	1,674.8	8.4	2,130.4	10.0
Def Test & Evaluation	42.5	.3	42.1	.3	53.0	.3	52.4	.3
TOTAL RDT&E	13,494.9	100.0	16,054.4	100.0	19,840.7	100.0	21,298.1	100.0

FY 1982



PROCUREMENT BY COMPONENT
($ MILLIONS)

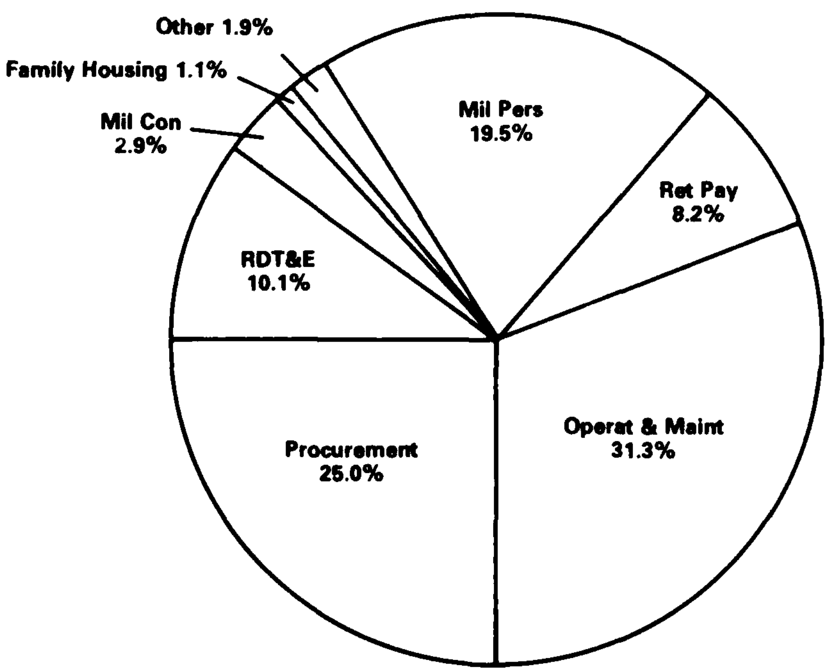
	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Army	6,542.3	18.6	8,969.1	20.0	9,873.9	20.1	12,706.1	21.1
Navy	15,649.8	44.3	19,858.9	44.2	20,949.8	42.7	24,334.8	40.3
Air Force	12,831.5	36.3	15,818.4	35.1	17,757.6	36.2	22,572.6	37.4
Def Agencies	288.7	.8	305.0	.7	483.7	1.0	742.9	1.2
TOTAL PROCUREMENT	35,312.3	100.0	44,951.4	100.0	49,065.0	100.0	60,356.4	100.0



RDT&E / PROCUREMENT AS % OF DOD
($ MILLIONS)

	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Mil Personnel	31,065	21.8	36,709	21.4	38,363	19.5	39,045	17.4
Retired Pay	11,920	8.4	13,917	8.1	16,077	8.2	18,093	8.0
Operat & Maint	46,605	32.8	54,159	31.6	61,492	31.3	66,993	29.8
Procurement	35,312	24.8	44,951	26.3	49,065	25.0	60,356	26.8
RDT&E	13,495	9.5	16,054	9.4	19,841	10.1	21,298	9.5
Mil Con	2,254	1.6	3,377	2.0	5,589	2.9	7,307	3.2
Family Housing	1,551	1.1	2,044	1.2	2,181	1.1	2,250	1.0
Spec Frgn Crncy	7		3		3		3	
Undist Conting			-85		3,514	1.8	9,177	4.1
Stock Funds			72		276	.1	359	.2
TOTAL	142,209	100.0	171,202	100.0	196,400	100.0	224,882	100.0

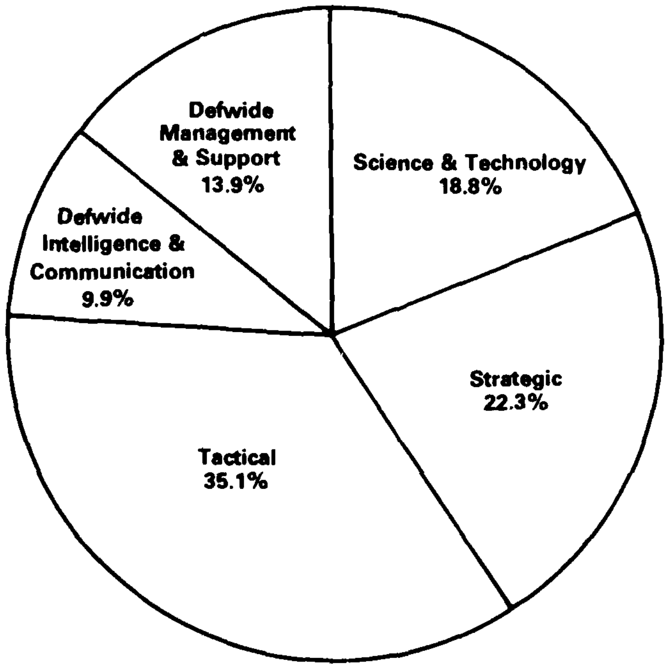
FY 1982



RDT&E BY MISSION CATEGORY
($ MILLIONS)

	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Sci & Tech Prog	2,869.4	21.2	3,156.9	19.7	3,739.4	18.8	4,466.1	21.0
Strategic Prog	2,187.8	16.2	3,469.5	21.6	4,417.1	22.3	4,466.9	21.0
Tactical Prog	5,313.3	39.4	5,680.9	35.4	6,960.7	35.1	7,170.2	33.7
Defwide Intel & Communications	1,128.4	8.4	1,513.7	9.4	1,960.4	9.9	2,290.4	10.7
Defwide Mgmt & Support	1,996.0	14.8	2,233.4	13.9	2,763.1	13.9	2,904.5	13.6
TOTAL RDT&E	13,494.9	100.0	16,054.4	100.0	19,840.7	100.0	21,298.1	100.0

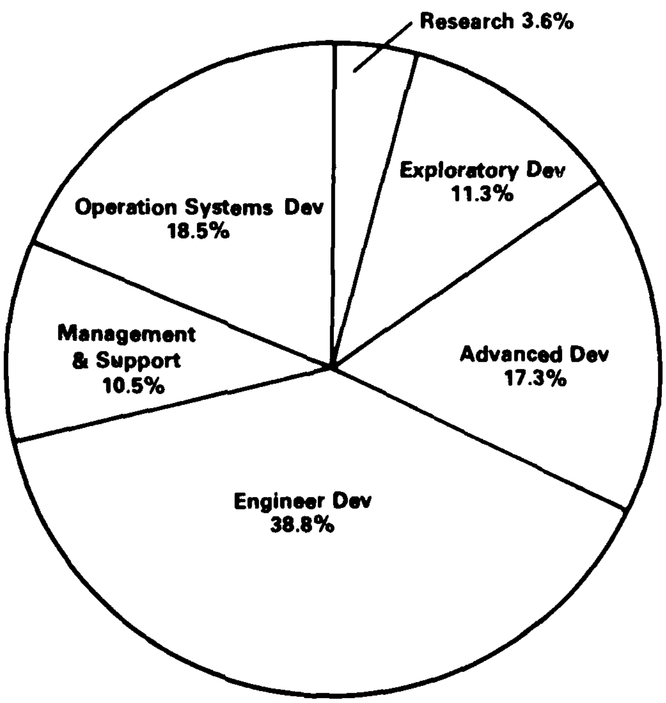
FY 1982



RDT&E BY ACTIVITY TYPE
($ MILLIONS)

	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Research	553.1	4.1	614.2	3.8	715.8	3.6	843.1	3.9
Exploratory Dev	1,712.2	12.7	1,939.7	12.1	2,233.6	11.3	2,535.3	11.9
Advanced Dev	2,810.5	20.8	2,820.6	17.6	3,424.4	17.3	4,573.4	21.5
Engineering Dev	4,617.5	34.2	6,040.1	37.6	7,698.8	38.8	7,186.7	33.7
Mgmt & Support	1,538.4	11.4	1,711.0	10.7	2,090.1	10.5	2,249.3	10.6
Operat Sys Dev	2,263.2	16.8	2,928.7	18.2	3,678.0	18.5	3,910.3	18.4
TOTAL RDT&E	13,494.9	100.0	16,054.4	100.0	19,840.7	100.0	21,298.1	100.0

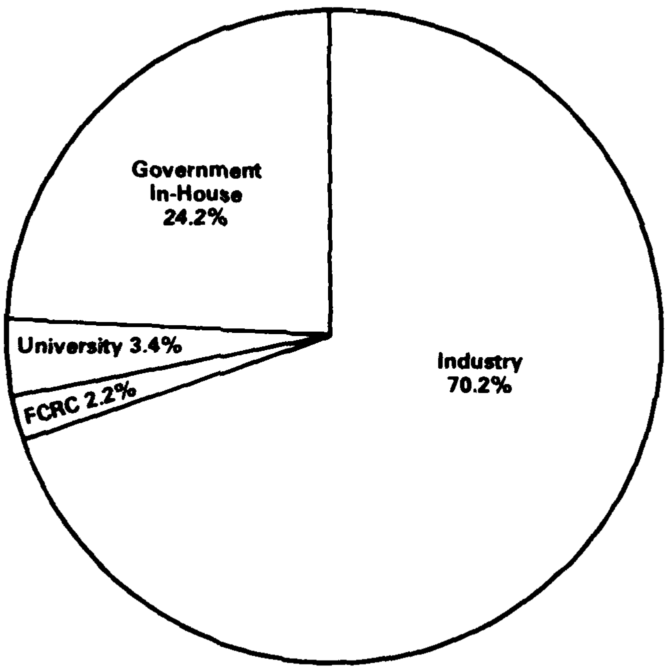
FY 1982



RDT&E BY PERFORMER
($ MILLIONS)

	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Industry	8,877.9	65.8	10,824.2	67.4	13,925.7	70.2	14,962.3	70.3
Govt In-House	3,837.8	28.4	4,311.4	26.9	4,801.7	24.2	5,133.0	24.1
Federal Contract Res Ctrs (FCRCs)	305.4	2.3	371.3	2.3	435.0	2.2	486.1	2.2
Universities	473.8	3.5	547.4	3.4	678.2	3.4	716.7	3.4
TOTAL RDT&E	13,494.9	100.0	16,054.4	100.0	19,840.7	100.0	21,298.1	100.0

FY 1982



RDT&E BY DEFENSE PROGRAMS

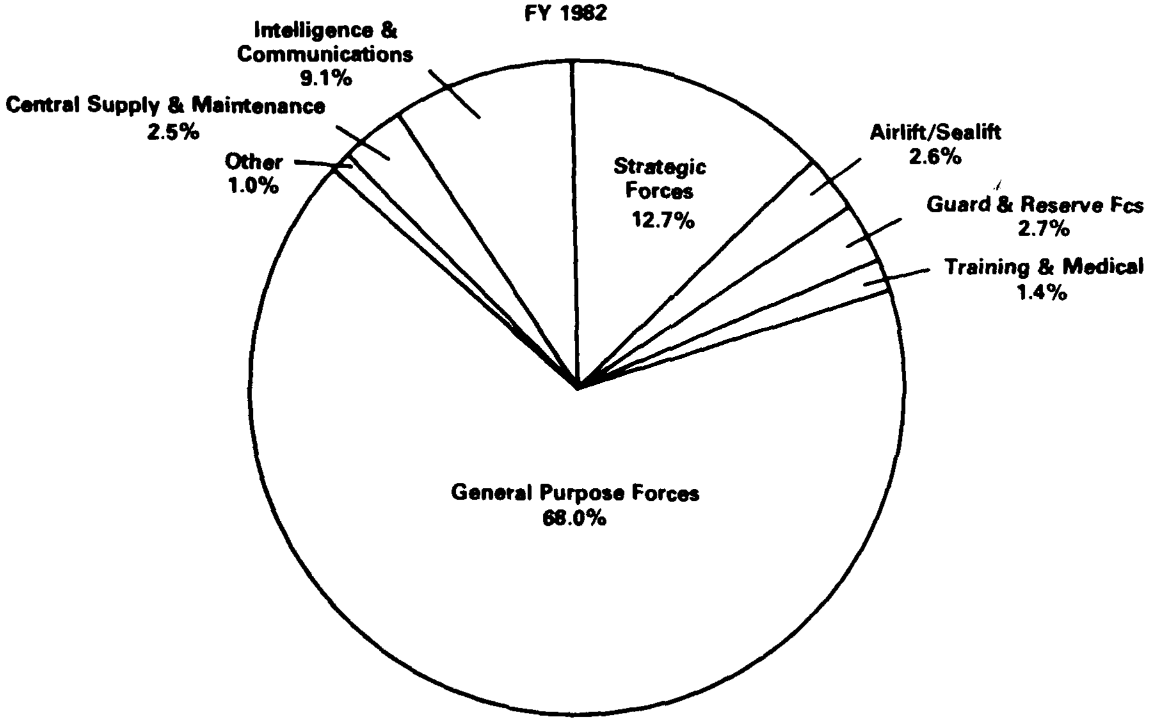
($ MILLIONS)

	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Strategic Forces	576.9	4.3	643.2	4.0	730.2	3.7	584.6	2.8
Gen Purp Forces	511.8	3.8	650.6	4.1	772.8	3.9	825.8	3.9
Intel & Communs	1,150.5	8.5	1,610.7	10.0	2,133.7	10.7	2,456.4	11.5
Airlift/Sealift	13.0	.1	11.0	.1	15.9	.1	13.7	.1
Res&Dev (Prog 6)	11,231.7	83.2	13,125.7	81.7	16,162.7	81.5	17,387.8	81.6
Cntrl Sply & Maint	8.2	.1	10.4	.1	21.4	.1	25.5	.1
Trng, Medical, Other	.7		.8		1.3		1.5	
Spt of Oth Nations	2.1		2.0		2.6		2.7	
TOTAL RDT&E	13,494.9	100.0	16,054.4	100.0	19,840.7	100.0	21,298.1	100.0

PROCUREMENT BY DEFENSE PROGRAMS
($ MILLIONS)

	FY 1980	%	FY 1981	%	FY 1982	%	FY 1983	%
Strategic Forces	4,605.2	13.0	5,193.5	11.6	6,216.5	12.7	8,172.4	13.5
Gen Purp Forces	23,855.5	67.6	31,316.3	69.7	33,359.5	68.0	40,230.8	66.7
Intel & Communs	3,297.8	9.3	3,729.0	8.3	4,441.9	9.1	5,893.3	9.8
Airlift/Sealift	400.3	1.1	840.4	1.9	1,265.7	2.6	1,428.9	2.4
Guard & Reserve Forces	1,468.9	4.2	1,633.5	3.6	1,348.2	2.7	1,508.2	2.5
Central Supply & Maintnce	976.4	2.8	1,186.3	2.6	1,212.6	2.5	1,845.2	3.0
Training, Medical	424.9	1.2	572.5	1.3	706.4	1.4	856.9	1.4
Administrative & Assoc Activs	40.1	.1	98.2	.2	150.2	.3	217.2	.4
Support to Other Nations	243.1	.7	382.0	.8	364.0	.7	203.4	.3
TOTAL PROCUREMENT	35,312.3	100.0	44,951.4	100.0	49,065.0	100.0	60,356.4	100.0

FY 1982



PROCUREMENT BY APPROPRIATION
($ MILLIONS)

	FY 1980	FY 1981	FY 1982	FY 1983
Aircraft Procurement, Army	946.2	1,076.4	1,361.7	1,886.4
Aircraft Procurement, Navy	4,331.7	6,110.7	6,960.3	8,309.3
Aircraft Procurement, Air Force	8,017.6	9,674.1	9,469.9	10,580.3
TOTAL AIRCRAFT PROC.	13,295.5	16,861.2	17,791.9	20,776.0
Missile Procurement, Army	1,150.3	1,519.8	1,650.5	2,191.2
Weapons (Missile) Proc, Navy	1,500.4	2,217.5	2,229.5	2,761.9
Missile Procurement, Air Force	2,159.2	3,140.9	4,274.5	7,016.7
TOTAL MISSILE PROC.	4,809.9	6,878.2	8,154.5	11,969.8
Weapons & Tracked Combat Vehicles, Army	1,811.1	2,582.2	2,719.8	3,017.5
Ammunition, Army	1,151.7	1,531.0	1,816.2	2,863.6
Weapons (Non-Missile) Procurement, Navy	492.1	520.7	488.3	700.0
Shipbldg & Conversion, Navy	6,464.4	7,483.6	6,639.6	6,664.2
Other Procurement, Army	1,483.0	2,259.7	2,325.7	2,747.4
Other Procurement, Navy	2,586.0	3,037.7	3,459.7	4,535.5
Other Procurement, Air Force	2,654.8	3,003.4	4,013.2	4,975.6
TOTAL OTHER PROC.	6,273.8	8,300.8	9,798.6	12,258.5
Procurement, Marine Corps	275.1	488.8	1,172.4	1,363.8
Procurement, Def Agcys	288.7	305.0	483.7	742.9
	35,312.3	44,951.4	49,065.0	60,356.4

PROCUREMENT BY AUTHORIZATION
($ MILLIONS)

	FY 1980	FY 1981	FY 1982	FY 1983
Aircraft				
Aircraft Procurement, Army	946.2	1,076.4	1,361.7	1,886.4
Aircraft Procurement, Navy	4,331.7	6,110.7	6,960.3	8,309.3
Aircraft Procurement, AF	8,016.7	9,674.1	9,469.9	10,580.3
Sub-Total Aircraft	13,294.6	16,861.2	17,791.9	20,776.0
Missiles				
Missile Procurement, Army	1,150.3	1,519.8	1,650.5	2,191.2
Weapons Procurement, Navy	1,500.5	2,217.4	2,229.5	2,761.9
Missile Procurement, AF	2,159.2	3,140.9	4,274.5	7,016.7
Missile Proc, Marine Corps	20.6	91.6	88.2	74.8
Sub-Total Missiles	4,830.6	6,969.7	8,242.7	12,044.6
Naval Vessels				
Shipbldg & Conversion, Navy	6,464.4	7,483.6	6,639.6	6,664.2
Tracked Combat Vehicles				
Procurement of Tracked Combat Vehicles, Army	1,651.7	2,273.4	2,395.0	2,624.5
Procurement, Marine Corps	12.5	46.6	281.0	341.5
Sub-Total Trkd Combat Veh	1,664.2	2,320.0	2,676.0	2,966.0
Torpedoes & Related Support Equip.				
Weapons Procurement, Navy	340.3	325.6	283.0	469.0
Other Weapons				
Procurement of Weapons & Other Combat Veh, Army	159.4	308.8	324.8	393.0
Weapons Procurement, Navy	151.8	195.1	205.3	231.0
Procurement, Marine Corps	26.1	42.7	56.9	8.7
Sub-Total Other Weapons	337.3	546.6	587.0	632.7
Total Procurement				
(Subject to Authorization)	26,931.4	34,506.7	36,220.2	43,552.5
All Other	8,380.9	10,444.7	12,844.8	16,803.9
TOTAL PROCUREMENT	35,312.3	44,951.4	49,065.0	60,356.4

APPENDIX B: ACRONYMS

AAH:	Advanced Attack Helicopter
AB:	Assault Breaker
ABM:	Anti-Ballistic Missile
ABRES:	Advanced Ballistic Reentry System
ABRV:	Advanced Ballistic Reentry Vehicle
ACAP:	Advanced Composite Airframe Program
ACCAT:	Advanced Command and Control Architectural Testbed
ACM:	Anti-Armor Cluster Munitions
ACMT:	Advanced Cruise Missile Technology
ADCP:	Acquisition and Distribution of Commercial Products
ADPG:	Air Defense Planning Group
AEWTF:	Aircrew Electronic Warfare Tactics Facility
AFSATCOM:	Air Force Satellite Communications
ALCC:	Airborne Launch Control Center
ALCM:	Air Launched Cruise Missile
AMRAAM:	Advanced Medium Range Air-to-Air Missile
ALWT:	Advanced Lightweight Torpedo
AMCM:	Advanced Mine Counter Measures
AMST:	Advanced Medium STOL Transport
ARP:	Anti-Radiation Projectile
ASALM:	Advanced Strategic Air Launched Missile
ASAT:	Anti-Satellite
ASPJ:	Airborne Self-Protection Jammer
ASRAAM:	Advanced Short Range Air-to-Air Missile
ASROC:	Anti-Submarine Rocket
ASUN:	Anti-Surface Ship Warfare
ATA:	Advanced Test Accelerator
ATD:	Advanced Technology Developments
ATGM:	Anti-Tank Guided Missile
AWACS:	Airborne Warning and Control System
BETA:	Battlefield Exploitation and Target Acquisition
BISS:	Base and Installation Security System
BMD:	Ballistic Missile Defense
BMEWS:	Ballistic Missile Early Warning System
BUIC:	Back-Up Intercept Control
BVR:	Beyond Visual Range
C^3:	Command, Control, and Communications
C/C:	Carbon/Carbon
CCR:	Circulation Control Rotor
CEP:	Circular Error Probable
CFV:	Cavalry Fighting Vehicle
CIA:	Central Intelligence Agency
CMCA:	Cruise Missile Carrier Aircraft
CONUS:	Continental United States
CRAF:	Civil Reserve Air Fleet
CSEDS:	Combat Systems Engineering Development Site
CSMS:	Corps Support Missile System
CSOC:	Consolidated Space Operations Center
CTBT:	Comprehensive Test Ban Treaty
CWW:	Cruciform Wing Weapon

DAR	Defense Acquisition Regulation
DARPA	Defense Advanced Research Projects Agency
DEW	Distant Early Warning
DIVAD	Division Air Defense Gun
DNA	Defense Nuclear Agency
DOD	Department of Defense
DRG	Defense Research Group
DSARC	Defense Systems Acquisition Review Council
DSCS	Defense Satellite Communication System
DSP	Defense Science Program
DTOC	Division Tactical Operations Center
ECM	Electronic Counter-Measures
ECCM	Electronic Counter Counter-Measures
ECR	Embedded Computer Resources
EMP	Electro-Magnetic Pulse
ERAM	Extended Range Antitank Mine
ETACCS	European Theater Air Command and Control Study
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FASCAM	Family of Scatterable Mines
FLIR	Forward Looking Infrared
FPR	Federal Procurement Regulation
FWE	Foreign Weapons Evaluation
GBU	Glide Bomb Unit
GEODSS	Ground Based Electro-Optical Deep Space Surveillance
GLCM	Ground Launched Cruise Missile
HARM	High Speed Anti-Radiation Missile
HEL	High Energy Laser
HOE	Homing Overlay Experiment
IC	Integrated Circuit
ICBM	Intercontinental Ballistic Missile
IEPG	Independent European Program Group
IFF	Identification of Friends or Foes
IFV	Infantry Fighting Vehicle
IIR	Imaging Infrared
IOC	Initial Operational Capability
IPD	Improved Point Defense
IRBM	Intermediate Range Ballistic Missile
IR&D	Independent Research and Development
IRST	Infrared Search and Track
IUS	Inertial Upper Stage
IUSS	Integrated Undersea Surveillance System
IWD	Intermediate Water Depth
JCMC	Joint Crisis Management Capability
JSC	Johnson Space Center
JSS	Joint Surveillance System
JTIDS	Joint Tactical Information Distribution System

LAAAS	Low Altitude Airfield Attack Systems
LANTIRN	Low Altitude Navigation and Targeting Infrared Night System
LAW	Light Anti-Tank Weapon
LDS	Layered Defense System
LOAD	Low Altitude Defense
LPI	Low Probability of Intercept
LRAAS	Long Range Airborne ASW Systems
LUA	Launch Under Attack
LWIR	Long Wave Infrared
MAB	Marine Amphibious Brigade
MANPADS	Man Portable Air Defense System
MCM	Mine Counter Measures
MENS	Mission Element Need Statement
MGT	Mobile Ground Terminals
MHSV	Multi-purpose High Speed Vehicle
MILCON	Military Construction
MIRV	Multiple Independently Targetable Reentry Vehicle
MLRS	Multiple-Launch Rocket System
MMC	Metal Matrix Composite
MMW	Milimeter Wave
MOU	Memorandum of Understanding
MRASM	Medium Range Air-to-Surface Missile
MTP	Manufacturing Technology Program
MX	Missile Experimental
NASA	National Aeronautics and Space Administration
NBC	Nuclear, Biological and Chemical
NGT	Next Generation Trainer
NM	Nautical Mile
OFPP	Office of Procurement and Policy
OSD	Office of the Secretary of Defense
OTH	Over-the-Horizon
OTHB	Over-the-Horizon Backscatter
PAPS	Periodic Armaments Planning System
PARCS	Perimeter Acquisition Radar Characterization System
PB	Particle Beam
PGM	Precision Guided Munitions
PLSS	Precision Location Strike System
PLU	Preservation of Location Uncertainty
POL	Petroleum Oil and Lubricants
PNVS	Pilot Night Vision System
PSP	Programmable Signal Processor
PTV	Propulsion Technology Validation
RAP	Rocket Assisted Projectile
RAWS	Remote Area Weather Station
R&D	Research and Development
RD&A	Research Development and Acquisition
RDT&E	Research Development Test and Evaluation
REMBASS	Remotely Monitored Battlefield Sensor System
RF	Radio Frequency
RLG	Ring Laser Gyro

ROCC	Region Operations Control Center
RPV	Remotely Piloted Vehicle
RSI	Rationalization, Standardization and Interoperability
RSP	Rapid Solidification Processing
RV	Re-entry Vehicle
SACDIN	Strategic Air Command Digital Information Network
SAGE	Semi-Automatic Ground Environment
SALT	Strategic Arms Limitation Talks
SAMS	Surface-to-Air Missile
SAMSO	Space and Missile System Organization
SED	Sensor Evolutionary Development
SGEMP	System Generated EMP
SIAM	Self-Initiated Anti-Aircraft Missile
SLBM	Submarine Launched Ballistic Missile
SLCM	Submarine Launched Cruise Missile
SLMM	Sub-Launched Mobile Mine
SOTAS	Stand Off Target Acquisition System
SPADOTS	Spare Detection and Tracking System
SRAM	Short Range Attack Missile
SSBN	Nuclear Powered Ballistic Missile Submarine
SSURADS	Shipboard Surveillance Radar Systems
S&T	Science and Technology
STC	Satellite Test Center
STP	Systems Technology Program
STR	Systems Technology Radar
SUAWACS	Soviet Union Airborne Warning and Control System
SURTASS	Surveillance Towed Array Sensor System
SXTF	Satellite X-Ray Test Facility
TADS	Target Acquisition and Designation System
TEL	Transporter Erector Launcher
TERCOM	Terrain Contour Matching
TGSM	Terminally Guided Submunitions
TLAM	Tomahawk Land Attack Missile
TALCM	Tactical Air Launched Cruise Missile
TACTAS	Tactical Towed Array Sonar
TNF	Tactical Nuclear Forces
TNW	Tactical Nuclear Warfare
$TNFS^3$	Theater Nuclear Forces, Survivability, Security and Safety
TRI-TAC	Joint Tactical Communications Program
USAF	United States Air Force
VAFB	Vandenberg Air Force Base
WAAM	Wide Area Anti-Armor Munitions
WVR	Within Visual Range
WP	Warsaw Pact
WWMCCS	Worldwide Military Command and Control System

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